City of Medford RWRF Proposed NPDES Permit Amendments to Fact Sheet (Evaluation Report)

State of Oregon Department of Environmental Quality

Oregon Department of Environmental Quality
Western Region Medford Office
221 Stewart Avenue
Medford OR 97501

Contact: Jonathan Gasik, MS, PE

Date: December 12, 2011

Background

DEQ is proposing to renew the National Pollutant Discharge Elimination System for the City of Medford Regional Wastewater Reclamation Facility (RWRF). The draft permit, fact sheet (evaluation report), and Thermal Credit Trading Program were made available for public comment from October 13, 2011 through November 25, 2011. A public hearing was held on November 16, 2011.

All comments were reviewed and, where appropriate, DEQ has revised the draft permit, as discussed in the response to comments memo. Comments regarding the fact sheet (evaluation report) are addressed in this errata sheet, which will be attached to the final fact sheet. Comments that did not result in changes to the documents are also addressed in the response to comments memo.

Section 2 Facility Description

Page 4, Section 2.3 Outfalls. The following sentence is added: "Outfall 001a is connected to the dechlorination channel via a weir and a mechanical valve."

Page 5, Paragraph 1, last sentence: The last paragraph is changed as follows:

"Figure 4-4, p. 2, above shows that the average dry weather flow remained below 20 million gallons per day (MGD) during the last seven years. The highest average dry weather flow was in 16.6 MGD in 2007. The highest monthly average flow (35.8 MGD) occurred in January 2006 and was more than twice the average dry weather flow. The peak day flow of 74.1 MGD occurred on December 31, 2005 and was almost 4.5 times the dry period average flow. This indicates relatively low I/I as compared to other facilities in Western Oregon."

Section 4 Receiving Water

Page 12, Section 4.2: The following paragraph is added to page 13:

"Outfall 001a is used only during extreme high flows. Per Schedule D, outfall 001a must only be used when the instantaneous flow to the plant exceeds 90 MGD. The treatment plant has not received flows exceeding 90 MGD since December 2005. The daily average and instantaneous treatment plant flows, and the daily average river flows are as follows:

Date	Maximum Instantaneous Plant Flow (MGD)	Daily Average Plant Flow (MGD)	Outfall 001a flow (MGD)	Rogue River Flow (cfs)
12/30/2005	91.9	68.3	~14 MGD	20,800
12/31/2005	93.6	74.1	~15 MGD	15,100

Using the Adams equation (M&E 3rd ed, pg 1224), the dilution at 20 feet downstream from outfall 001 is approximately 16:1 under the 12/31/2005 condition. Outfall 001a is approximately 40 feet downstream of

outfall 001. Using the PLUMES equations for initial mixing (M&E 3rd ed, pg 1228), the dilution from outfall 001a is approximately 36:1. Therefore, the dilution during these high flow scenarios exceeds the dilutions during all low flow scenarios.

For clarification, DEQ has added a condition to the permit restricting the use of outfall 001a to days when the instantaneous flow exceeds 90 mgd."

Page 13, Section 4.2.1: The following sentences are added to the last paragraph on page 13:
"DEQ revised the dilution estimates using CORMIX 7.0GT. All dilution estimates use the treatment plant design averge dry weather flow of 20 MGD (31 CFS). The actual dry weather flow is not expected to exceed 20 MGD during the term of the proposed permit."

Page 20, Section 5.3.1.1 Ammonia: The following sentences are added to this section:
"40 CFR Part 122.45(f) Mass limitations, states that all pollutants limited in permits shall have limitations, standards or prohibitions expressed in terms of mass except:
(i) For pH, temperature, radiation, or other pollutants which cannot appropriately be expressed by mass;
(ii) When applicable standards and limitations are expressed in terms of other units of measurement; or
(iii) If in establishing permit limitations on a case-by-case basis under Sec. 125.3, limitations expressed in terms of mass are infeasible because the mass of the pollutant discharged cannot be related to a measure of operation (for example, discharges of TSS from certain mining operations), and permit conditions ensure that dilution will not be used as a substitute for treatment.

The primary purpose for mass limits is to prevent water quality violations from cumulative effects of conservative pollutants. Mass-based limits are particularly important for control of bioaccumulative pollutants. Ammonia, however, is neither a conservative nor a bioaccumulative pollutant since microbes in the receiving stream rapidly oxidize ammonia into nitrate. Therefore, cumulative effects outside of the regulatory mixing zone are not a concern. Also, the Medford RWRF mixing zone does not overlap any other mixing zones. Addtionally, effluent limits calculations are based on critical low flow conditions without any allowance for degradation in the mixing zone. Under these conditions, mass-based limits in addition to concentration-based limits are unnecessary for protection on water quality."

Page 20, Section 5.3.1.3 Chlorine: The following sentences are added to this section:
"Similar to ammonia, chlorine is neither a conservative nor a bioaccumulative pollutant since chlorine reapidly reacts with organic matter. Therefore, cumulative effects outside of the regulatory mixing zone are not a concern. Also, the Medford RWRF mixing zone does not overlap any other mixing zones. Addtionally, effluent limits calculations are based on critical low flow conditions without any allowance for degradation in the mixing zone. Under these conditions, mass-based limits in addition to concentration-based limits under these conditions are unnecessary for protection on water quality."

Page 23, Section 5.3.2: The first sentence of the sixth paragraph is changed as follows:
"The aquatic toxicity RPA evaluation indicates that there is no reasonable potential for the discharge to cause or contribute to an excursion above the water quality criteria for copper, lead, mercury, silver, zinc, and cyanide at the edge of the defined mixing zone and ZID, and for all other pollutants at the end of pipe."

Page 23, Section 5.3.2: The first sentence of the seventh paragraph is changed as follows:
"The human health RPA evaluation indicates that there is no reasonable potential for the discharge to cause or contribute to an excursion above the water quality criteria for arsenic, nickel and chloroform at

the edge of the defined mixing zone, and for all other pollutants at the end of pipe (see Appendix B3, p. 53)."

Page 24, Section 5.3.2.1. Arsenic: This section is deleted in its entirety because EPA approved the revised human health arsenic criteria of 2.1 µg/L.

Page 27, Section 5.3.2.2. Temperature: The following sentence is added to the first paragraph on this page:
"OAR 340-041-0028(4) states that the temperature criteria is a seven-day-average maximum not to be exceeded. Per DEQ's temperature IMD, these critieria are applied as a rolling seven-day-average."

Page 30, Section 5.4.1 Evaluation of Complaince Options: The following paragraph is added:
"West Yost and Associates, Medford RWRF's engineering consultants, analyzed the potential thermal reductions through in-plant changes. While radiant healing in the process tanks can be significant during the hottest months, during October wastewater is generally cooled as it passes through the treatment plant. Therefore, only projects that remove heated water sources have the potential to reduce temperature during the critical period (October). The most significant in-plant heat source during the critical period is the cooling water from the cogeneration system, which adds about 10.3 million kcals/day to the effluent. Medford RWRF is replacing the cogeneration system with a new system that will include a radiator cooled engine; this project is scheduled to be completed by August 2012. While other sources of heat at the treatment plant are relatively insignificant, DEQ and Medford RWRF will consider other alternatives as they become available. A permit condition in Schedule B requires Medford RWRF to report these activities annually."

Page 32, Section 5.4.3.1. Interim Limits: The second sentence of the second paragraph is changed as follows:
"The Medford RWRF's initial proposed schedule for obtaining thermal credits (June 27, 2011) was based on an initial start up period (2012 – 2014) followed by shading improvements in two-year increments (15%, 20%, 25%, 20%, and 20%) and used critical case calculations provided by DEQ in writing on June 14, 2011."

Page 39, Section 6.2.1.1: The fourth paragraph of this section is revised as follows:
"Requirements for the calculation of mass-based BOD and TSS limits are found in 40 CFR 133.102 and Oregon Adminstrative Rules Chapter 340 Division 41. While the federal regulations do not require a daily maximum mass-based limits, state regulations may be more restrictive. For existing facilities, OAR 340-041-0061(9) states that:

A) During periods of low stream flows (approximately May 1 through October 31), the monthly average mass load expressed as pounds per day may not exceed the applicable monthly concentration effluent limit times the design average dry weather flow expressed in million gallons per day times 8.34. The weekly average mass load expressed as pounds per day may not exceed the monthly average mass load times 1.5. The daily mass load expressed in pounds per day may not exceed the monthly average mass load times 2.0.

B) During the period of high stream flows (approximately November 1 through April 30), the monthly average mass load expressed as pounds per day may not exceed the monthly concentration effluent limit times the design average wet weather flow expressed in million gallons per day times 8.34. The weekly average mass load expressed as pounds per day may not exceed the monthly average mass load times 1.5. The daily mass load expressed in pounds per day may not exceed the monthly average mass load times 2.0.

C) On any day that the daily flow to a sewage treatment facility exceeds the lesser hydraulic capacity of the secondary treatment portion of the facility or twice the design average dry weather flow, the daily mass load limit does not apply. The permittee must operate the treatment facility at highest and best practicable treatment and control.

The monthly average mass load summer mass limits for CBOD5 and TSS are based on the design average dry weather flow (ADWF) of 20 MGD and the monthly average CBOD5 and TSS concentration limits of 10 mg/L and 10 mg/L, respectively. The winter mass limits for the facility are be based on the AWWF of 25.3 MGD and the monthly average BOD5 or TSS concentration limits of 30 mg/L and 30 mg/L, respectively."

Page 39, Section 6.2.1.1: The calculations section is changed as follows:

"On October 31, 2010, DEQ finalized an Internal Management Directive regarding rounding and significant figures (Sig Fig IMD). Per this IMD, mass limits for BOD and TSS are rounded to 2 significant figures and calculated results where the rounded digit is 5 are rounded up. Therefore, the calculations are as follows:

(1) Summer CBOD5 and TSS

Limit	Calculation	Value (ppd)	Rounded Value (ppd)
Monthly Average	20 MGD x 8.34 #/gal x 10 mg/L	1,668	1,700
Weekly Average	1,700 ppd x 1.5	2,550	2,600
Daily Maximum	1,700 ppd x 2.0	3,400	3,400

(2) Winter BOD5 and TSS

Limit	Calculation	Value (ppd)	Rounded Value (ppd)
Monthly Average	25.3 MGD x 8.34 #/gal x 30 mg/L	6,330	6,300
Weekly Average	6,300 ppd x 1.5	9,450	9,500
Daily Maximum	6,300 ppd x 2.0	12,600	13,000

Page 40, Section 6.2.1.3: The sentence "DMR data for the existing permit cycle was reviewed and effluent data met the permit limit and basin standards. DEQ evaluated pH using a spreadsheet that derives the pH at the mixing zone boundary (see Appendix B4, p. 54)." is changed to:

"Worst case ambient stream flow, pH, temperature and alkalinity were entered into a spreadsheet that derives the pH at the mixing zone boundary (see Appendix B4, p. 54). For the purposes of this evlaution, the maximum and minimum effluent pH was assumed to be 9.0 and 6.0 respectively. The spreadsheet shows that the maximum and minimum instream pH at the edge of the mixing zone would be 8.2 and 6.6, respectively. This is well with the allowed range."

Appendix B4 is replaced with the following:

Calculation of pH of a mixture of two flows.
Based on the procedure in EPA's DESCON program (EPA, 1988. Technical Guidance on Supplementary Stream Design Conditions for Steady State Modeling. USEPA Office of Water, Washington D.C.)

	RPA for pH	
INPUT	Lower pH Criteria	Upper pH Criteria
1. DILUTION FACTOR AT MZ BOUNDARY - (Qe+Qr)/Qe	14	14
2. UPSTREAM/BACKGROUND CHARACTERISTICS		
Temperature (deg C):	16.4	16.4
pH:	7.3	8.1
Alkalinity (mg CaCO3/L):	30.1	30.1
3. EFFLUENT CHARACTERISTICS		
Temperature (deg C):	23.4	23.4
pH:	6.0	9.0
Alkalinity (mg CaCO3/L):	107.0	107.0
4. APPLICABLE PH CRITERIA	6.5	8.5
OUTPUT		
1. IONIZATION CONSTANTS		
Upstream/Background pKa:	6.41	6.41
Effluent pKa:	6.36	6.36
2. IONIZATION FRACTIONS		
Upstream/Background Ionization Fraction:	0.89	0.98
Effluent Ionization Fraction:	0.30	1.00
3. TOTAL INORGANIC CARBON		
Upstream/Background Total Inorganic Carbon (mg CaCO3/L):	33.97	30.71
Effluent Total Inorganic Carbon (mg CaCO3/L):	351.89	107.24
4. CONDITIONS AT MIXING ZONE BOUNDARY		
Temperature (deg C):	16.90	16.90
Alkalinity (mg CaCO3/L):	35.59	35.59
Total Inorganic Carbon (mg CaCO3/L):	56.68	36.18
pKa:	6.40	6.40
pH at Mixing Zone Boundary:	**6.6**	**8.2**
Is there Reasonable Potential?	**No**	**No**

State of Oregon
Department of
Environmental
Quality

National Pollutant Discharge Elimination System
PERMIT EVALUATION REPORT AND FACT SHEET
October 5, 2011
Oregon Department of Environmental Quality
Western Region - Medford Office
221 W. Main Street, Suite 201
Medford, Oregon 97501
(541) 776-6010

Permittee:	City of Medford 411 West Eighth Street Medford, Oregon 97501
Existing Permit Information:	File Number: 55125 Permit Number: 100985 Expiration Date: November 30, 2007 EPA Reference Number: OR002626-3
Source Contact:	Dennis Baker, WRD Superintendent 541-774-2750
Source Location:	Medford Regional Water Reclamation Facility 1100 Kirtland Road Central Point, OR 97502
LLID:	1244292424210-130.5-D
Receiving Stream/Basin:	Rogue River
Proposed Action:	Renew NPDES Major – Domestic Municipal Permit Application Number: 973788 Date Received: October 25, 2007
Source Category:	NPDES Major – Domestic
Sources Covered:	Treated Domestic Sewage / Recycled Water
Permit Writer:	Jonathan Gasik, MS, PE Senior Environmental Engineer / Western Region / Medford Office June 30, 2011

City of Medford
Regional Wastewater Reclamation Facility
National Pollutant Discharge Elimination System
Permit Evaluation Report and Fact Sheet

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1 Introduction

The Department of Environmental Quality (DEQ) proposes to renew the National Pollutant Discharge Elimination System (NPDES) wastewater permit for the City of Medford Regional Water Reclamation Facility (Medford RWRF) located at 1100 Kirtland Road, Central Point, Oregon. This permit allows and regulates the discharge of treated sewage to the Rogue River in the Rogue Basin.

The existing NPDES permit expired on November 30, 2007. DEQ received renewal application number 973788 on October 25, 2007. Because the permittee submitted a renewal application to DEQ in a timely manner, the existing permit will not expire until DEQ takes final action on the renewal application as per OAR 340-045-0040.

This permit evaluation report describes the basis and methodology used in developing the permit. The permit is divided into several sections:

Schedule A – Waste discharge limitations not to be exceeded
Schedule B – Minimum monitoring and reporting requirements
Schedule C – Compliance conditions and schedules
Schedule D – Special conditions
Schedule E – Pretreatment activities
Schedule F – General conditions

The Federal Water Pollution Control Act of 1972 and its subsequent amendments, as well as Oregon Revised Statutes (ORS 468B.050), require a NPDES permit for the discharge of wastewater to surface waters. This proposed permit action by DEQ complies with both federal and state requirements.

2 Facility Description

2.1 Location and Background

The existing Medford RWRF is located on the former Camp White treatment plant site. The City acquired this site and treatment facilities from the federal government in 1948. The original plant consisted of a grit channel, comminutor (shredder), primary sedimentation basin, trickling filters, secondary clarifier, chlorine contact channel, and primary and secondary anaerobic digesters. An anaerobic digester and two secondary clarifiers, now serving as emergency sludge holding basins, are the only remnants of the old Camp White plant.

In 1969, the various entities now served by the plant entered into an agreement to construct and operate the Medford RWRF. The initial treatment units were constructed in 1970. Significant expansion of the treatment plant was required around 1980. These phased expansions included

primary and secondary sedimentation expansion as well as upgrades to influent screening and aeration basin capacity. The treatment plant continues to be upgraded on a regular basis as required to meet increasing wastewater flows and updated regulatory requirements.

Figure 2-1: Location map of Medford RWRF

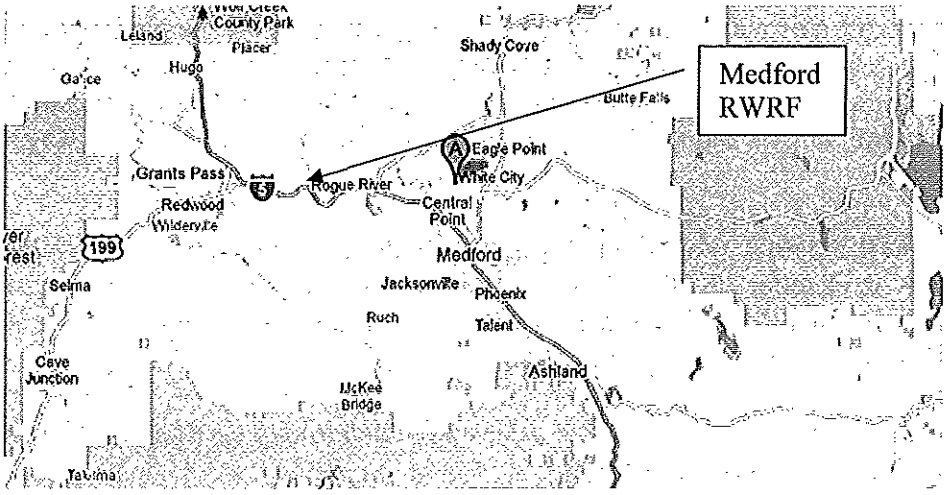


Figure 2-2: Facility Layout

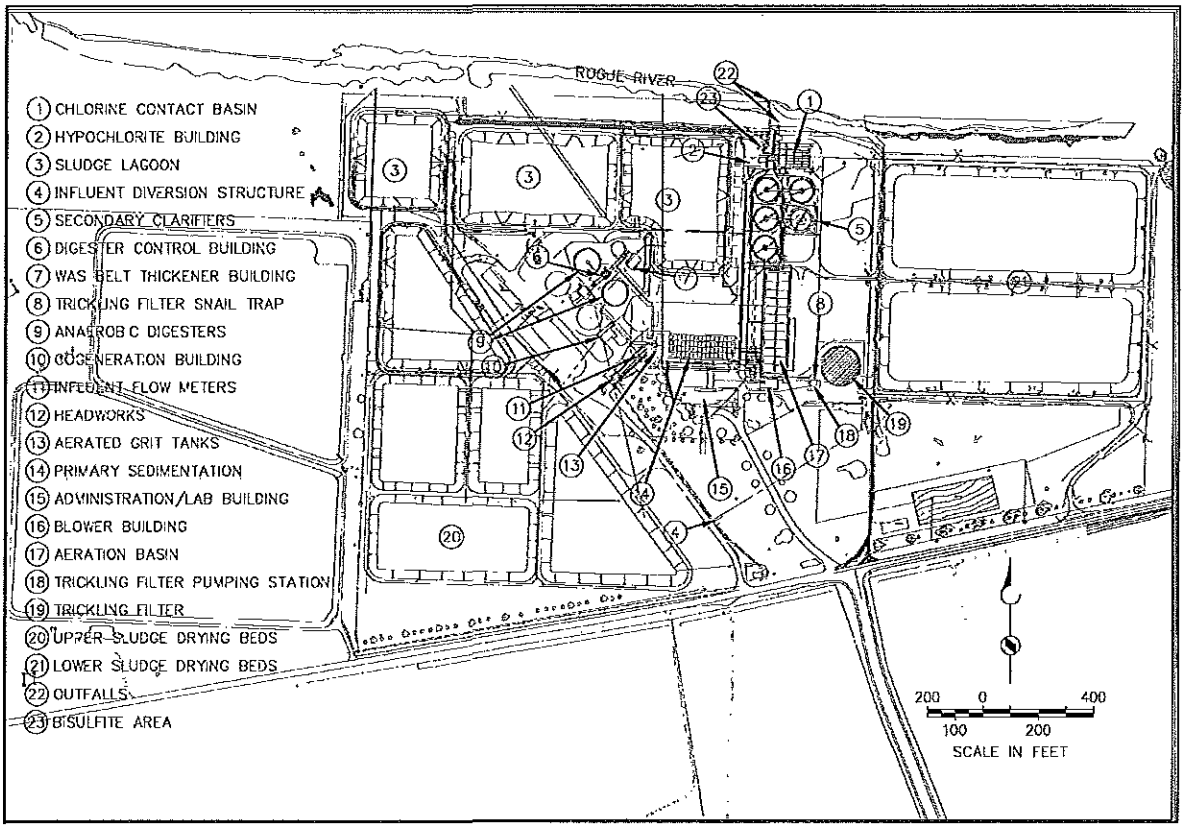
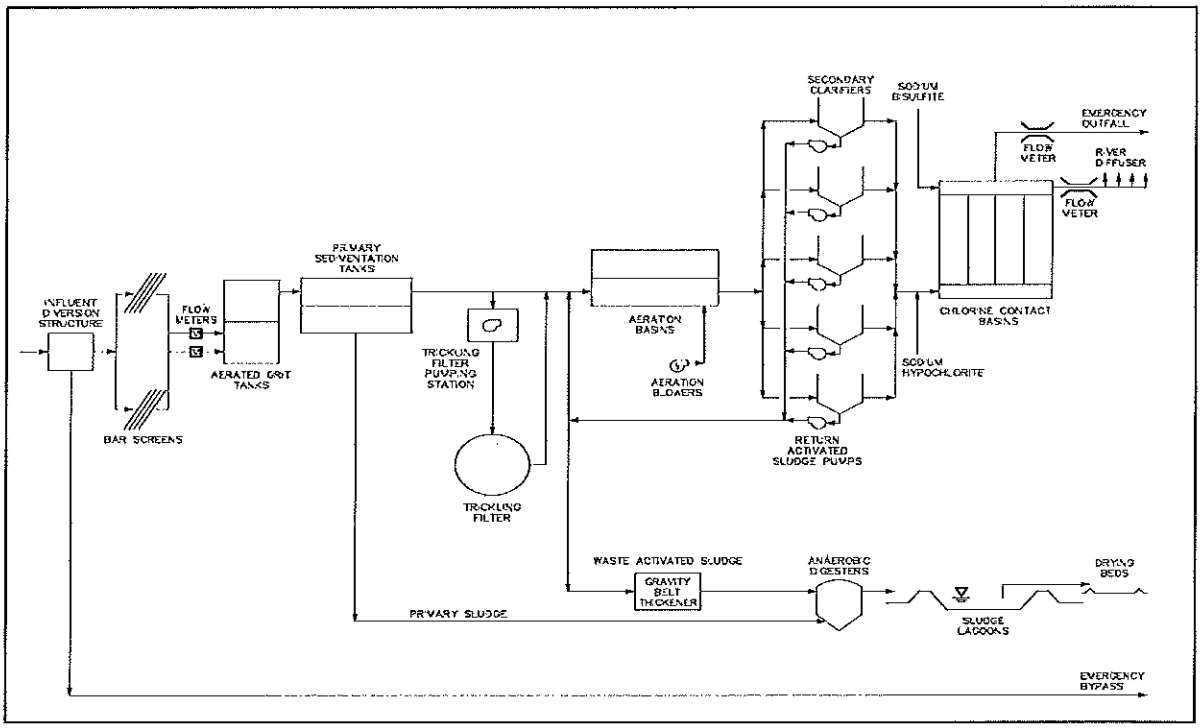


Figure 2-3: Simplified Process Flow

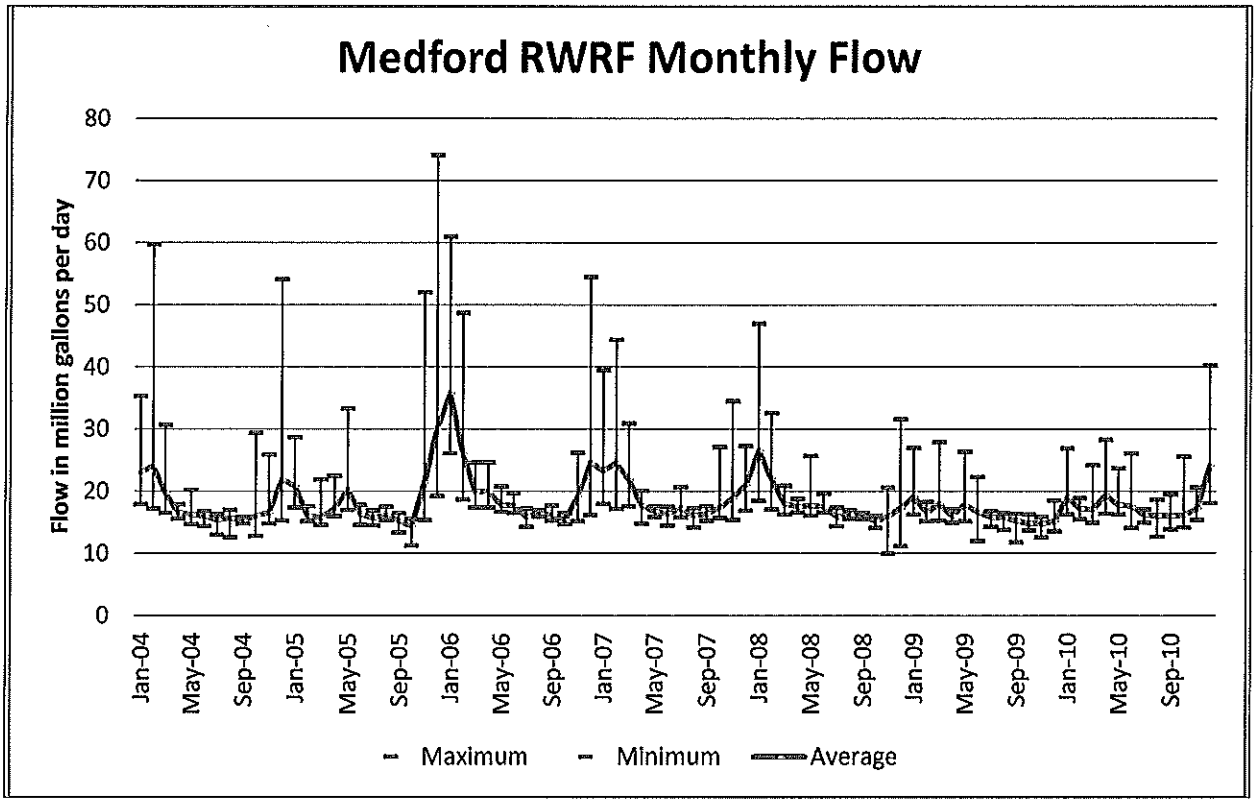


2.2 Hydraulic Capacity

Capacity of a treatment facility is evaluated in terms of both hydraulic capacity (how much water can pass through the system) and treatment capacity. Dry weather design flows are based on treatment capacity and wet weather (peak) design flows are based on hydraulic capacity.

The existing permit is based on an average dry weather design flow of 20 million gallons per day (MGD). The actual 2010 average dry weather flow (May-Oct) was 16.65 MGD. The current design peak hydraulic capacity is 80 MGD. As can be seen from the following graph, peak flows did not exceed 80 MGD between 2004 and the present.

Figure 2-4: Medford RWRF Flows



2.3 Outfalls

The existing permit contains the following outfalls for treated wastewater at the RWRF:

Outfall 001 Treated Wastewater (multiport diffuser) at RM 130.5
Outfall 001a Treated Wastewater (42 inch outfall) at RM 130.5
Outfall 002 Reclaimed Water Reuse

Outfall 001 has a multi-port diffuser with a peak capacity of 100 MGD. This outfall was constructed to improve the mixing and hydraulic capacity of the previous outfall (designated Outfall 001A). Prior to the construction of Outfall 001, Outfall 001A was the primary outfall, but now only receives discharge during large winter storm events. Outfall 001A discharges through a 42 inch pipe to a shoreline outfall through a vortex energy dissipation structure, which entrains air into the effluent and produces foam near the outfall. The old outfall is still functional and can be used for emergency purposes. The combined capacity of the two outfalls is 170 MGD.

The emergency outfalls are listed in the following table.

Table 2-1: Emergency Outfall Locations

Outfall	Outfall Location	Discharge Location
003	Airport P.S., Manhole #1G40 3500 Medco Haul Road	Midway Creek
005	Fairview/Greenway P.S., Manhole #6J16 Fairview & Greenway	East Irrigation Canal to Larson/Bear Creeks
006	Montcrest P.S., Wetwell Manhole South of Donnalee Drive	Under I-5 into Bear Creek
007	Army Reserve P.S., Manhole #5D14 Columbus & McAndrews	Drainage Ditch/Storm Drain to Bear Creek
008	Broad Street P.S., Manhole #5D6 Broad & Taft	Drainage Ditch/Storm Drain to Bear Creek
009	King Center P.S., Manhole #0G18 Commerce Dr. & Cardinal Way	Midway Creek
010	Influent Diversion Structure	Stormwater Outfall

DEQ is proposing to remove Emergency Overflow Outfalls 003 through 010 from the face page of the permit with this renewal.

2.4 Inflow and Infiltration

Inflow and infiltration (I/I) are terms used to describe the ways that groundwater and stormwater enter sanitary sewer systems. Inflow is stormwater that enters sanitary sewer systems directly through drains, manhole covers, and cross connections with stormwater conveyance pipes. Infiltration is groundwater that enters sanitary sewer systems through cracks and/or leaks in the sanitary sewer pipes.

The Medford RWRF receives wastewater from both the City of Medford and Rogue Valley Sanitary Services (RVSS) sewerage systems. The City of Medford's sewerage system consists of approximately 248 miles of gravity sewers and a total of five pump stations. The RVSS sewerage system consists of approximately 380 miles of gravity sewers and a total of twenty three pump stations. The majority of the sewer pipes in the Medford system are greater than 25 years old. The majority of the pipes in the RVSS system are less than 25 years old.

Figure 2-4, p. 4, above shows that the average dry weather flow remained below 20 million gallons per day (MGD) during the last seven years. The maximum daily flow during this period (74.1 MGD) occurred in December 2005. Since that time, the 7-day average flow is nearly three times the dry period average flow. The highest monthly average flow of 5.7 MGD occurred in January 2008 and was more than five times the average dry weather flow. The peak day flow of 74.1 MGD occurred during December 2005 and was more than four times the dry period average flow.

In 2009, the U.S. Environmental Protection Agency (EPA) conducted a Clean Water Act compliance investigation of both the Medford and RVSS sanitary sewer collection systems. The investigation used the EPA's January 2005 *Guide for Evaluating Capacity, Management, Operation, and Maintenance (CMOM) at Sanitary Sewer Collection Systems* to evaluate CMOM program activities. The EPA tallied the total number of sanitary sewer overflows (SSOs), categorized the SSOs as major or minor (major SSOs are those with a volume greater than or equal to 1,000 gallons), and determined how many of the SSOs were due to inadequate capacity in the sewer pipes or at pump stations. The following table summarizes the SSO review from the EPA's investigation (2003 – 2008) with additional data for 2009 and 2010.

Table 2-2: Summary of SSOs

Year	Medford			RVSS		
	Total	Major	Capacity	Total	Major	Capacity
2003	5	5	1	10	6	0
2004	0	0	0	2	1	1
2005	8	8	2	12	8	3
2006	2	1	0	7	5	4
2007	0	0	0	2	1	
2008	4	3	0	4	3	0
2009	2	0	0	1	0	0
2010	1	0	0	2	0	0

Both Medford and RVSS have developed and implemented inflow and infiltration (I/I) reduction programs that include smoke testing, sewer televising, sewer repairs, manhole sealing, and elimination of storm drain connections. The above table shows continual progress towards reducing SSOs. Medford has not had any rain-induced overflows since 2005 and RVSS has not had any rain-induced overflows since 2006.

The proposed permit renewal prohibits Medford from discharging raw sewage. However, DEQ recognizes that SSOs can result from causes beyond the city's reasonable control (such as catastrophic failure of a sewer pipe, the treatment plant, or pump station and/or extreme rainfall events). Therefore, DEQ will continue to exercise enforcement discretion with respect to SSOs on a case by case basis.

To further ensure that the Medford RWRF's I/I program is working, the proposed permit continues to require a removal efficiency of 85% for both biochemical oxygen demand (BOD_5) and total suspended solids (TSS). The Medford RWRF has not violated the above removal efficiency limits.

2.5 Biosolids Management

Biosolids are the materials resulting from the treatment of sewage sludge. When treated and processed, sewage sludge becomes biosolids that can be safely recycled and applied as fertilizer.

The federal and state requirements for biosolids management are in 40 CFR Part 400 and OAR 340-050, respectively.

The Medford RWRF currently complies with the biosolids management regulations by drying and disposing the dried material at the Dry Creek Landfill; although they still retain the ability to land apply Class B biosolids to farmland. During the term of the existing permit, all biosolids were disposed of at the Dry Creek Landfill. The rules regarding disposal of wastes in landfills are in OAR Chapter 340, Division 93.

The Medford RWRF's latest revisions of the biosolids management plan were approved by DEQ in March 2001 (see Attachment #1). The plan characterizes the City's past and proposed biosolids handling, treatment and marketing operations.

The existing permit states: "Monitoring of biosolids in accordance with this Schedule is not required unless the sludge is beneficially land applied as biosolids". Since no biosolids have been land applied, no monitoring was required. However, the Medford RWRF chose to determine the potential for the sludge to leach pollutants using the Toxicity Characteristic Leaching Procedure (TCLP). The TCLP results indicate that the leachable toxics in the sludge are well below levels of concern. See Biosolids Management Plan, Attachment #1, for testing results and other details.

2.6 Stormwater

NPDES permits for stormwater are required for wastewater treatment facilities with a design flow of greater than 1 MGD when stormwater is collected and discharged from the plant site. Stormwater from this site is regulated under the 1200-Z NPDES general permit assigned to this facility. DEQ has not issued any informal or formal enforcement actions in regard to the stormwater permit.

2.7 Groundwater

Most units at the RWRF are manufactured of concrete. The three sludge storage lagoons are lined with a 60 mil HDPE liner placed over a 130 mil geotextile fabric. The sludge drying beds are compacted soil covered with asphalt. Therefore, there are no groundwater concerns provided that proper operations and maintenance occurs to maintain the structural integrity of the underground piping. A completed groundwater prioritization worksheet is included in Appendix A, p. 50.

To protect groundwater, Schedule A of the permit contains a restriction prohibiting activities that could cause an adverse impact on existing or potential beneficial uses of groundwater. Schedule D also requires that facilities be operated in accordance with the permit conditions and no adverse groundwater quality impacts (complaints or other indirect evidence) occur otherwise Medford RWRF will be required conduct an additional groundwater evaluation.

2.8 Industrial Pretreatment

Section 307(b) of the federal Clean Water Act established the National Industrial Pretreatment Program (IPP) to control the indirect discharge of pollutants to publicly-owned treatment works (POTWs) by "industrial users". The goal of the pretreatment program is to protect POTWs and receiving waters from hazardous and toxic wastes generated by industrial users. The program is also designed to protect the quality and use of sludge and biosolids generated by the treatment plant and protect workers at the plant. Discharges to a POTW are regulated primarily by the POTW itself with oversight of the POTW pretreatment program the responsibility of DEQ.

The City of Medford implements an IPP that was originally approved by DEQ on July 7, 1983. There have been several modifications to the City's pretreatment program ordinance. The most recent modifications were approved on December 9, 2008. (See Attachment #2).

The City of Medford currently permits 18 significant industrial users (SIUs). SIUs include categorical industries, which are SIUs because of the industrial category, and non-categorical SIUs, which are SIUs because of the significant volume and/or loading of wastewater discharged to the system. Four of the SIUs served by the Medford RWRF are categorical industrial users (CIUs) and are listed below:

- Anodex Anodizing – Aluminum anodizing
- Erickson Air Crane – Helicopter manufacturing, plating of metal parts
- Medford Plating – Chrome and nickel plating of automobile parts
- Technical Plating, Inc. – Electroplating

The non-categorical industries served by the Medford RWRF include industrial laundries, food production (milk, cheese, frozen foods, fruit processing), specialty gas production for semiconductor industry, plywood manufacturing, medical film production, cement fiberboard manufacturing, and landfill leachate.

The last Pretreatment Compliance Inspection (PCI) of the industrial pretreatment program was conducted on November 1-2, 2005. The primary focus of the PCI was to evaluate the accuracy of the information provided in previous annual reports and the adequacy of program implementation and industrial user compliance records and files. Although there were some compliance concerns noted in the audit, DEQ's pretreatment coordinator found the City of Medford to be administering a strong, well managed pretreatment program. DEQ considers Medford's Industrial Pretreatment Program as operating in compliance with the NPDES permit and federal requirements 40 CFR §403.

3 Permit History

3.1 Permit Term

The existing permit was issued on December 31, 2002. There have been no modifications during the term of this permit.

3.2 Compliance History

The site was last inspected on February 24, 2010 and was found to be operating in compliance with the terms of the current NPDES wastewater permit. DEQ determined that the facility is well operated and well maintained.

The monitoring reports for this facility are reviewed by DEQ upon receipt. Prior to drafting the propose permit, compliance history and inspection reports were reviewed. Based on this review, the following Warning Letter (WL) violations have been documented at this facility during the term of the existing permit (See Table 3-1 below).

Table 3-1: Enforcement Actions for Medford RWRF

Violation Date	WL Date	Parameter	Violation Class
7/20/2006	9/20/2006	Exceeded chlorine limits due to equipment failure	Class 2
10/18/2009	12/31/2009	Exceeded weekly TSS limit during week of 10/18/2009	Class 2
October 2009	12/31/2009	Exceeded monthly TSS limit	Class 2

The above violations are considered to be minor and have been corrected. Therefore, DEQ considers this facility to be in substantial compliance with the terms of the existing permit.

4 Receiving Water

The Medford RWRF discharges to the Rogue River at River Mile 130.5. This is in the Middle Rogue Sub-basin section of the Rogue River Basin. OAR 340-041-0271 (Table 271A) lists the beneficial uses for which water quality will be protected. Included in Table 271A for the 'Rogue River Mainstem from Estuary to Lost Creek Dam' are: public and private domestic water supply, industrial water supply, irrigation, livestock watering, fish and aquatic life (including rearing/migration and spawning), wildlife and hunting, fishing, boating, water contact recreation, aesthetic quality, and commercial navigation & transportation. DEQ's drinking water protection program has identified three public water supply intakes downstream from the Medford RWRF serving the City of Gold Hill, the City of Rogue River and the City of Grants Pass.

DEQ utilizes Fish Use Designation maps and Salmon and Steelhead Spawning Use Designation maps to identify applicable temperature criteria for each basin. The Rogue Basin maps are contained in OAR 340-041. According to DEQ's fish use maps for this stream (OAR 340-041-0028, Figures 271A and 271B), the Fish Use Designation at this location is 'Salmon and Trout Rearing and Migration' year-round (Figure 271A) and the Salmon and Steelhead Spawning Use Designation is 'Spawning during September 15 to June 15 (Figure 271B). The water quality standards for all waterbodies (OAR 340-41) and specifically the Rogue Basin (OAR 340-041-0271) were developed to protect these beneficial uses.

4.1 Receiving Stream Water Quality

According to DEQ's 2010 Integrated Report Database "303(d) List" of Water Quality Limited Water Bodies, the Rogue River is not water quality limited at this location. However, the Rogue River is water quality limited downstream (see Table 3). Water quality assessments have been performed for both bacteria and temperature and waste load allocations have been assigned to point sources that may be contributing to the water quality violations.

Table 4-1: 303(d) Listed Water Parameters for the Rogue River

Rogue River Mile	Assessment Parameter	Criteria	Season
94.9 to 110.7	Fecal Coliform	Log mean of 200 organisms per 100 ml; no more than 10% > 400 per 100 ml	Summer
0 to 124.8	Temperature	Salmon and trout rearing and migration: 18.0° C 7-day-average maximum	Year-round

The Rogue Basin Total Maximum Daily Load (TMDL) was approved by the U.S.EPA on December 29, 2008. The TMDL was issued in response to specific streams being included on DEQ's list of impaired waterbodies ("303(d) List") which was submitted to the United States Environmental Protection Agency (EPA) for approval. The federal Clean Water Act (CWA) requires that these listed streams have TMDLs developed to determine appropriate pollutant limits to ensure water quality standards will be met. The Rogue Basin TMDLs provide pollutant Waste Load Allocations (WLA) for parameters specific to each Subbasin.

Chapter three of the 2008 TMDL addresses bacteria in the watershed. The *E. coli* bacteria WLA assigned to point sources is expressed as a load derived from the numeric criterion of a 30-day log mean of 126 *E. coli* organisms / 100ml, based on a minimum of five samples; and No single sample may exceed 406 *E. coli* organisms / 100ml and the applicable flow. The existing permit limit for *E. coli* is based from the OAR rules for bacteria, "Shall not exceed 126 organisms per 100 mL monthly geometric mean. No single sample shall exceed 406 organisms per 100 mL." OAR 340-041-0009(1)(a) lists freshwater other than shellfish growing waters limited at "A 30-day log mean of 126 *E. coli* organisms / 100ml, based on a minimum of five samples; and No single sample may exceed 406 *E. coli* organisms / 100ml". The Medford RWRF's effluent data has consistently been below the water quality standard for bacteria.

Chapter two of the 2008 Rogue Basin TMDL addresses temperature and individual NPDES permittees are assigned a point source thermal Waste Load Allocation (WLA) from April 1 through October 31. WLAs are flow-based heat load allocations meant to restrict point sources to a 0.2 °C cumulative increase to the 7- day average of the daily maximum (7DADM) temperature at river flows equal to or greater than the 7-day average low flow with a 10-year recurrence (7Q10). The Medford RWRF was allocated 0.1772 °C of the 0.2 °C cumulative increase.

Water temperature affects the cycles of aquatic species and is a critical factor in maintaining and restoring healthy salmonid populations throughout the state. It is the policy of the Environmental Quality Commission (EQC) to protect aquatic ecosystems from adverse temperature changes caused by anthropogenic activities. The purpose of the temperature criteria listed in OAR 340-041-0028 is to protect designated beneficial uses that are temperature sensitive, including salmonids in waters of the State. As discussed above, the Rogue River is water quality limited for temperature and WLAs have been established for the point sources discharging into the Rogue River. In addition the TMDL temperature requirements, the Medford RWRF discharge must also meet the cold water protection and thermal plume requirements. Analysis demonstrating compliance with these rules is discussed below.

The Medford RWRF collects temperature data in the Rogue River. The following figures summarize the 7-day average of the daily maximum temperatures upstream of Medford RWRF (2005 – 2010) and effluent (2004 – 2010):

Figure 4-1: Rogue R. 7-day Average of Daily Maximum Temperatures

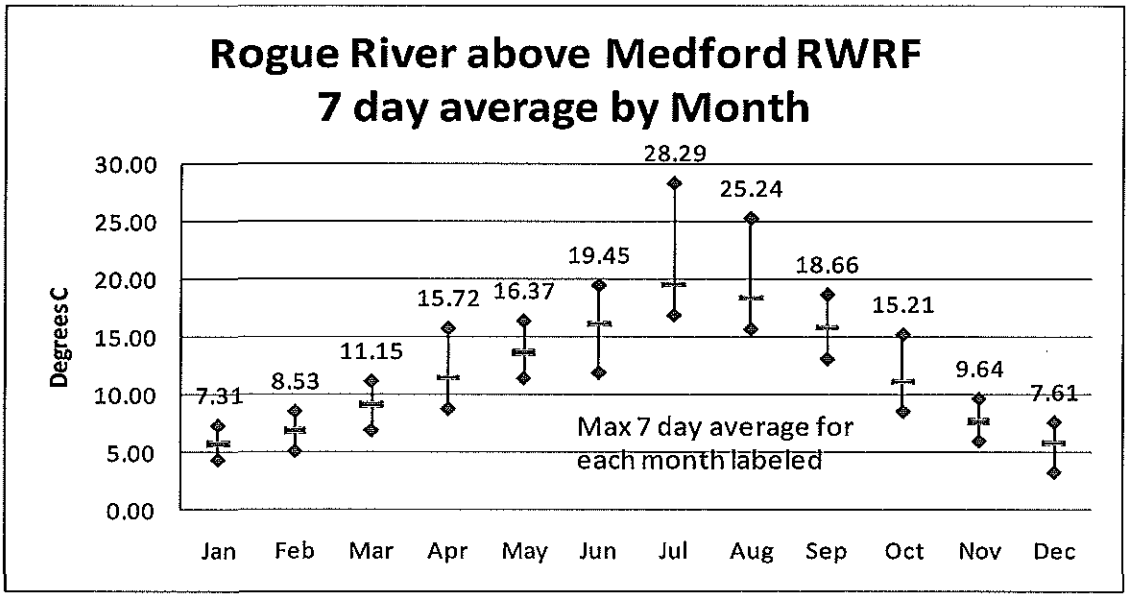
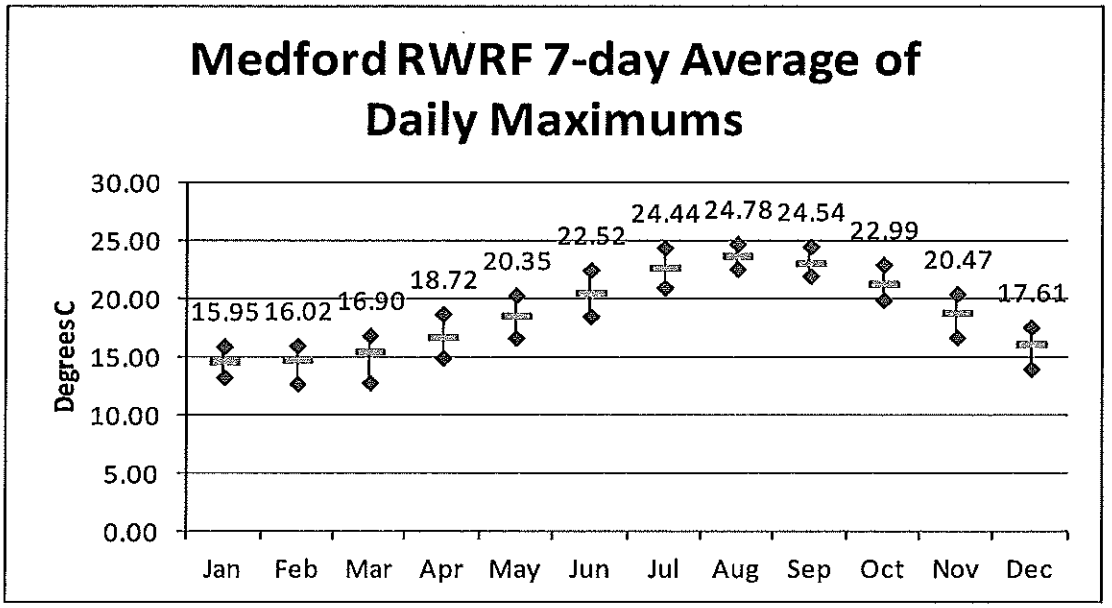


Figure 4-2: Medford RWRF 7-day Average of Daily Maximum Temperatures



4.2 Mixing Zone Analysis

4.2.1 Regulatory Mixing Zone

Federal regulations and Oregon Administrative Rules allow DEQ to suspend all or part of the water quality standards in small, designated areas around a discharge point. Initial mixing of the wastewater with the receiving stream occurs in these small areas. These are known as "allocated impact zones" or "regulatory mixing zones." Two mixing zones can be developed for each discharge: 1) The acute mixing zone, also known as the "zone of initial dilution" (ZID), and 2) the chronic mixing zone, usually referred to as "the mixing zone." The ZID is a small area where acute criteria can be exceeded as long as it does not cause acute toxicity to organisms drifting through it. The mixing zone is an area where acute criteria must be met but chronic criteria can be exceeded. It must be designed to protect the integrity of the entire water body. The applicable rules for Oregon are found in OAR 340-041-0053.

The regulatory mixing zone is defined in the existing permit as follows:

> The allowable mixing zone is that portion of the Rogue River contained within a band extending out one hundred (100) feet from the south bank of the river and extending from a point ten (10) feet upstream of the outfall to a point three hundred (300) feet downstream from the outfall. The Zone of Immediate Dilution (ZID) shall be defined as that portion of the allowable mixing zone that is within thirty (30) feet of the point of discharge."

On December 2007, DEQ finalized a Regulatory Mixing Zone Internal Management Directive. (MZ IMD). The MZ IMD became effective July 1, 2008. DEQ will process all completed applications received after this date under the guidelines contained in the IMD. The Medford

RWRF application was submitted on October 26, 2007 and is therefore not subject to the requirements of the MZ IMD (such as submittal of a MZ dilution study) during this permit renewal. However, the Medford RWRF will need to submit all required documents with the next renewal.

In 1998 the City installed a new multiport outfall diffuser and in April 1998, conducted an analysis of the available dilution based on the CORMIX model. Although CORMIX2 was developed to predict dilution from multiport diffusers, the software design at that time required that all diffuser ports have the same orientation to river flow. Therefore, the analysis used multiple runs of CORMIX1, since the Medford RWRF diffuser ports are oriented in different directions. The 1998 analysis estimated the following dilutions at the edge of the regulatory mixing zone.

Table 4-2: Regulatory Mixing Zone Dilutions

Effluent Discharge Flow (MGD)	Dilution at the edge of the MZ	Dilution at the edge of the ZID
20	13.9	2.1
30	14.5	1.9
40	11.5	1.7

For aquatic life criteria, the EPA recommends estimating the pollutant concentrations during critical low river flow conditions. The EPA has determined that the 7-day average low flow over a 10-year period (7Q10) is reasonably protective. The 7Q10 flow used in the 1998 study was 846 cfs, based on the data from USGS gauge 14339000 Rogue River at Dodge Bridge, Eagle Point, Oregon. The station is located at River Mile 138.6 (Lat 42° 31'30", long 122° 50'30") in SE 1/4 sec.17, T.35 S., R.1 W., Jackson County, Hydrologic Unit 17100307). This is about 8.1 miles upstream from the outfall.

CORMIX2 has since been updated to include a module for a fanned out diffuser port configuration (CORMIX 7.0GT). The diffuser can be approximately simulated using the fanned out configuration at 15° angle to the stream flow. Additionally, Little Butte Creek, the largest tributary between Dodge Bridge and the Medford RWRF has a stream gage. The sum of the critical low flows at these two gages provides a conservative estimate of the low flow at the Medford RWRF. The following table summarizes the critical low flows calculated from the Dodge Bridge and Little Butte Creek gages and the modeled dilution at the edge of the regulatory mixing zone and ZID using the updated version of CORMIX2.

Table 4-3: RMZ Critical Low Flow Dilutions (cfs)*

	Dodge Bridge	Little Butte	Sum*	Dilution @ ZID	Dilution @ RMZ
7Q10	857	11.1	870	8.8	14.0
30Q5	972	17.5	990	9.3	16.4
Harmonic Mean	1850	48	1900	14.4	30.4

*Rounded to two significant figures

7Q10 - lowest 7-day average flow with an average recurrence frequency of 10 years. This flow is used to evaluate the discharge for aquatic toxicity and develop permit limits for the protection of aquatic life if needed.
30Q5 - lowest 30-day average flow with an average recurrence frequency of 5 years. This flow is used to evaluate the discharge for impacts to human health from non-carcinogens and develop permit limits if needed.
Harmonic mean flow - long-term mean flow value calculated by dividing the number of daily flows by the sum of the reciprocals of those daily flows. This flow is used to evaluate the discharge for impacts to human health from carcinogens and develop permit limits if needed (pollutants known to cause cancer).

4.2.2 Thermal Plume

DEQ also evaluated the facility's discharge for compliance with the thermal plume limitations in accordance with OAR 340-041-0053(2)(d) to ensure the discharge does not potentially cause adverse effects to salmonids. In accordance with OAR 340-041-0053(2)(d), temperature mixing zones and thermal effluent limits will be established as necessary to prevent or minimize the following adverse effects on salmonids:

A) Impairment of an active salmonid spawning area where spawning redds are located or likely to be located.
B) Acute impairment or instantaneous lethality.
C) Thermal shock caused by sudden increase in water temperature.
D) Migration blockage caused by temperature differential between the plume and the receiving stream.

Impairment of spawning: The area in the immediate vicinity of the discharge is an active spawning area for winter steelhead, summer steelhead, resident trout, and Coho salmon. Since the effluent temperature exceeds 13°C during the spawning period, DEQ must determine the potential impact to salmonid spawning outside of the Zone of Immediate Dilution (ZID).

Spawning impairment is prevented or minimized by limiting potential fish exposure to temperatures above 13° C [OAR 340-041-0053(2)(d)(A)]. However, when the ambient temperature of the river upstream of the discharge is 13°C or greater, then the spawning criterion and the human use allowance, rather than the thermal plume limitation drives any permit limitations. Therefore, to evaluate potential spawning impacts due to thermal plume, the river temperature is assumed to be 12.7°C, since the human use allowance is 0.3°C outside of the TMDL period [OAR 340-041-0028(12)(b)(A)].

The thermal plume was modeled during the first two weeks of the spawning season (September 16-31) using the program CORMIX 7.0GT. The late October 7Q10 stream flow (1085 cfs), 90th percentile effluent flow (16.5 MGD), and the upper 90th percentile of the two week average effluent temperature (22.8°C) were used in this evaluation. The CORMIX evaluation predicts a plume temperature of 13.63°C at the edge of the ZID. The plume cools to 13°C approximately 186 meters (610 feet) downstream of the discharge. However, the plume is buoyant and initially floats over the spawning area. The model predicts that that the effluent does not interact with the bottom

until 265 meters (869 feet) downstream of the outfall. Therefore, this evaluation indicates that the effluent is not likely to impair an active spawning area.

The figures below show the modeled temperatures in graph form, and a plan and profile view of the thermal plume.

Figure 4-3: Modeled Temperatures Downstream of Outfall

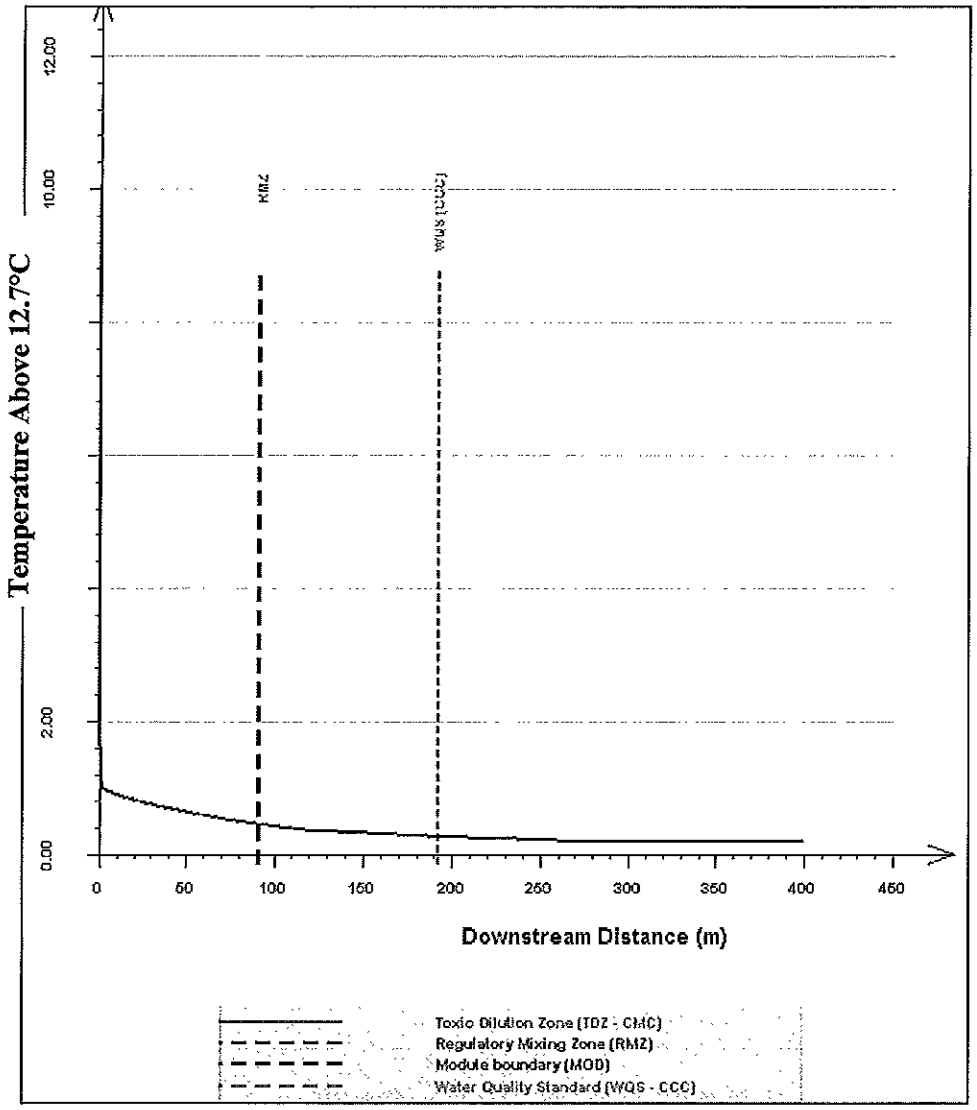


Figure 4-4: Modeled Plume Plan View

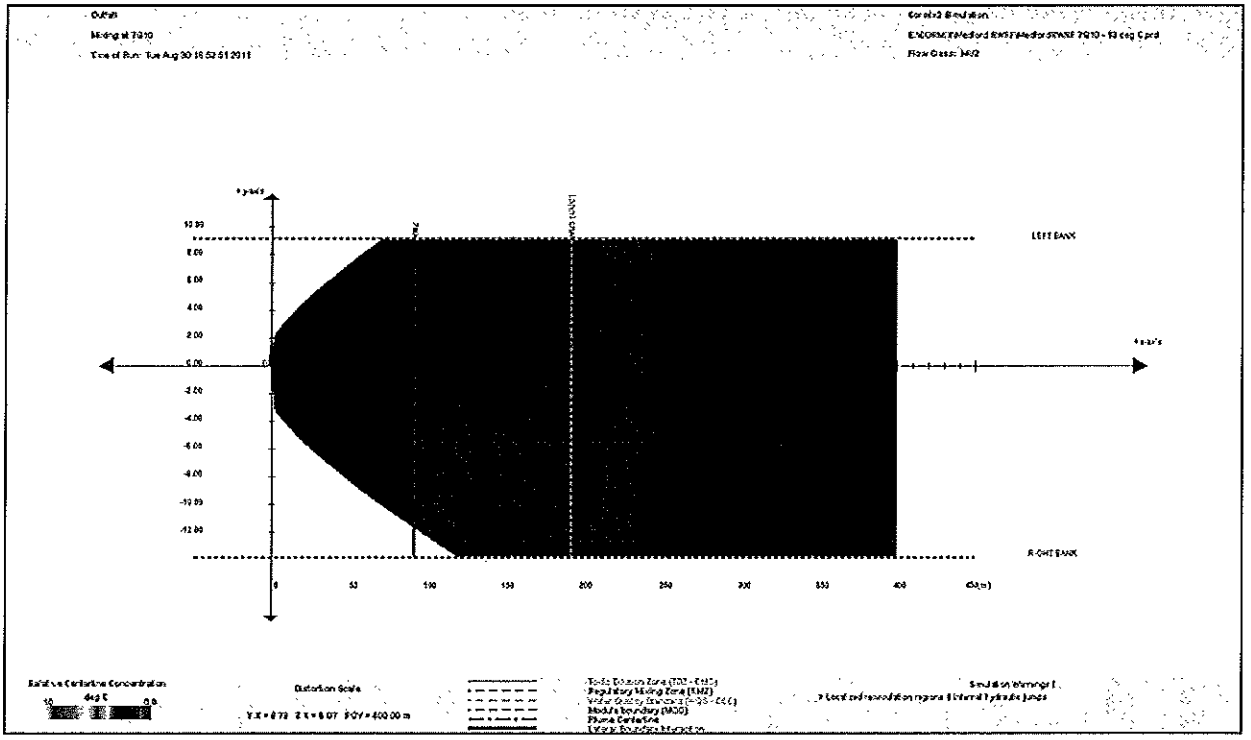
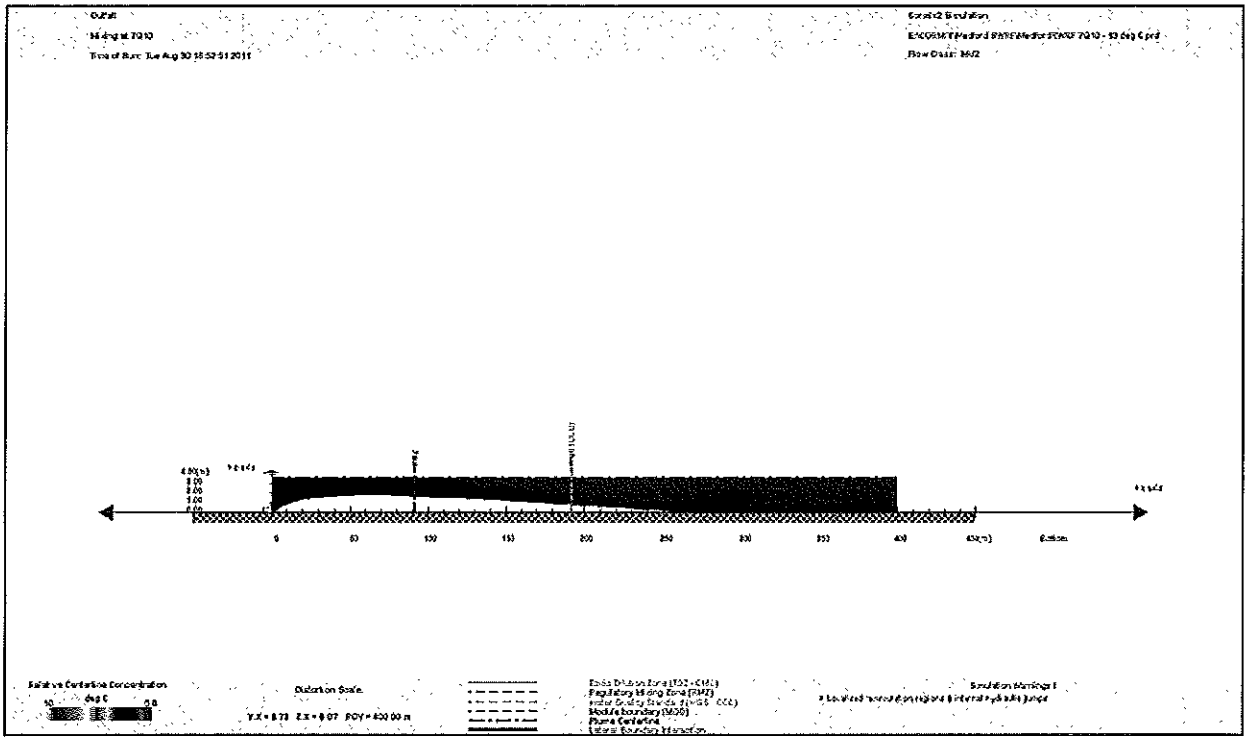


Figure 4-5: Modeled Plume Profile View



Acute impairment or instantaneous lethality is prevented or minimized by limiting potential fish exposure to temperatures of 32°C or more to less than two seconds. Acute impairment requirements are met because all of the City's effluent temperature data was below this temperature.

Thermal shock is prevented or minimized by limiting potential fish exposure to temperatures of 25°C or more to less than 5% of the cross section of the water body. Thermal shock requirements are met since the maximum effluent temperature (24.94°C) is less than 25°C.

Migration blockage is prevented or minimized by limiting potential fish exposure to temperatures of 21°C or more to less than 25% of the cross section of the water body, when stream temperatures are less than 21°C. From Figure 4-1 above, the average stream temperature is less than 21° during all months of the year. The upper 90th percentile stream temperature is 16.4°C. From Figures 4-2 and 4-3 above, the maximum effluent temperature is 24.9 and the maximum 7-day average effluent temperature is 24.78°C. Migration blockage requirements are met since there is no reasonable potential when using these values in the RPA spreadsheet. (See Appendix C2, p. 56.)

5 Permit Limits

There are two categories of effluent limits for NPDES permits: Technology-based effluent limits (TBEL) and water quality-based effluent limits (WQBEL).

Technology-based effluent limits define a minimum level of treatment using readily-available technology. For domestic wastewater treatment facilities, federal technology-based effluent limits address biochemical oxygen demand (BOD_5), total suspended solids (TSS) concentrations, removal efficiency and pH.

The minimum treatment levels referred to above are the secondary treatment standards established by the EPA for domestic wastewater treatment facilities (found in 40 CFR Part 133). Domestic facilities must achieve biochemical oxygen demand (BOD_5) and suspended solids (TSS) monthly average concentrations of 30 mg/L and weekly average concentrations of 45 mg/L. If carbonaceous biochemical oxygen demand ($CBOD_5$) is substituted for BOD_5, the monthly average concentration is 25 mg/L and the weekly average concentration is 40 mg/L. In addition, a minimum removal efficiency of 85% is required of domestic dischargers for BOD_5 (or $CBOD_5$) and TSS. Finally, the pH must be between 6.0 and 9.0.

In contrast, water quality-based effluent limits are developed independent of the available treatment technology and, instead, take into account the quality and quantity of the receiving stream. Water quality-based effluent limits are typically more stringent than technology-based permit limits when the receiving stream is small, is water quality-limited or shows evidence of impairment,

Upon renewing/reissuing a permit, a permit writer evaluates the existing limits in the permit against changes to technology based standards and water quality standards that may have

occurred during the permit term. With some exceptions, the anti-backsliding provisions (described in CFR 122.44(l)) do not allow relaxation of effluent limits in renewed/reissued permits; therefore, the most stringent of the existing or new limits must be included in the new permit.

5.1 Existing Permit Limits

The existing permit contains the following effluent limits in Schedule A:

Treated Effluent Outfall 001 and 001A

(1) June 1 - October 31:

Parameter	Average Effluent Concentrations Monthly	Weekly	Monthly* Average lb/day	Weekly* Average lb/day	Daily* Maximum lbs
$CBOD_5$ (See Note 1)	10 mg/L	15 mg/L	1700	2600	3400
TSS	10 mg/L	15 mg/L	1700	2600	3400

(2) November 1 - May 31:

Parameter	Average Effluent Concentrations Monthly	Weekly	Monthly* Average lb/day	Weekly* Average lb/day	Daily* Maximum lbs
BOD_5	30 mg/L	45 mg/L	6300	9500	13,000
TSS	30 mg/L	45 mg/L	6300	9500	13,000

* Average dry weather design flow to the facility equals 20 MGD. Summer mass load limits based upon average dry weather design flow to the facility. Winter mass load limits based upon average wet weather design flow to the facility equaling 25.3 MGD. The daily mass load limit is suspended on any day in which the flow to the treatment facility exceeds 40 MGD (twice the design average dry weather flow). The permittee shall operate the treatment facility at the highest and best practicable treatment and control.

Other Waste Discharge Limitations not to be exceeded after permit issuance.

Treated Effluent Outfall 001 and 001A

Other parameters (year-round except as noted)	Limitations
E. coli Bacteria	Shall not exceed 126 organisms per 100 mL monthly geometric mean. No single sample shall exceed 406 organisms per 100 mL.

Other parameters (year-round except as noted)	Limitations
Total Chlorine Residual	Shall not exceed a monthly average concentration of 0.02 mg/L and a daily maximum concentration of 0.04 mg/L
Ammonia-N (Jun-Oct) (Interim Limit)	Shall not exceed a monthly average concentration of 13 mg/L and a daily maximum concentration of 25 mg/L.
pH	Shall be within the range of 6.0 - 9.0
BOD_5 Removal Efficiency (Nov-May)	Shall not be less than 85% monthly average
$CBOD_5$ Removal Efficiency (Jun- Oct)	Shall not be less than 85% monthly average
TSS Removal Efficiency	Shall not be less than 85% monthly average
Excess Thermal Load (May 1 through Oct 31)	Shall not exceed 1,900 MBTUs/day weekly average.

5.2 Technology-Based Effluent Limits

Oregon technology-based treatment standards are established through minimum design criteria for domestic treatment facilities stated in the Oregon Administrative Rules. In this portion of the Rogue Basin, the BOD_5 and TSS minimum design criteria are monthly average concentrations of 10 mg/L in the low stream flow period and secondary treatment standards in the high stream flow period (OAR 340-041-0275(3)). In addition, there are (16) Minimum Design Criteria for Treatment and Control of Wastes regarding disinfection, dilution of oxygen demanding pollutants, and prevention of raw sewage overflows (OAR 340-041-0007(16)).

5.3 Water Quality-Based Effluent Limits

5.3.1 Review of Existing Water Quality Based Effluent Limits

Previous evaluations determined there is a reasonable potential for the effluent to exceed the water quality criteria for chlorine and ammonia. Accordingly, the existing permit contains effluent limits for chlorine and ammonia. These effluent limits are reviewed in the following discussion.

5.3.1.1 Ammonia

Ammonia is a substance normally found in wastewater. The wastewater treatment processes, particularly aeration and biological treatment, can convert (oxidize) a large portion to nitrate and nitrite, but the treated effluent still contains some ammonia. After discharge, continued ammonia oxidation removes dissolved oxygen from the receiving stream. Un-oxidized ammonia is also a toxic agent and may have to be limited to prevent in-stream toxicity. Ammonia toxicity varies with pH and temperature of the water. Finally, ammonia and other nitrogen compounds are

nutrients that can contribute to excessive biological growth that may cause violations of water quality standards. The problems could manifest as visual or aesthetic impairment or could be the cause of large fluctuations of dissolved oxygen or pH.

The following figures show that the Medford RWRF has consistently been able to meet the current ammonia limits of 25 mg/L (maximum) and 13 mg/L (monthly average).

Figure 5-1: Medford RWRF Daily Ammonia Levels

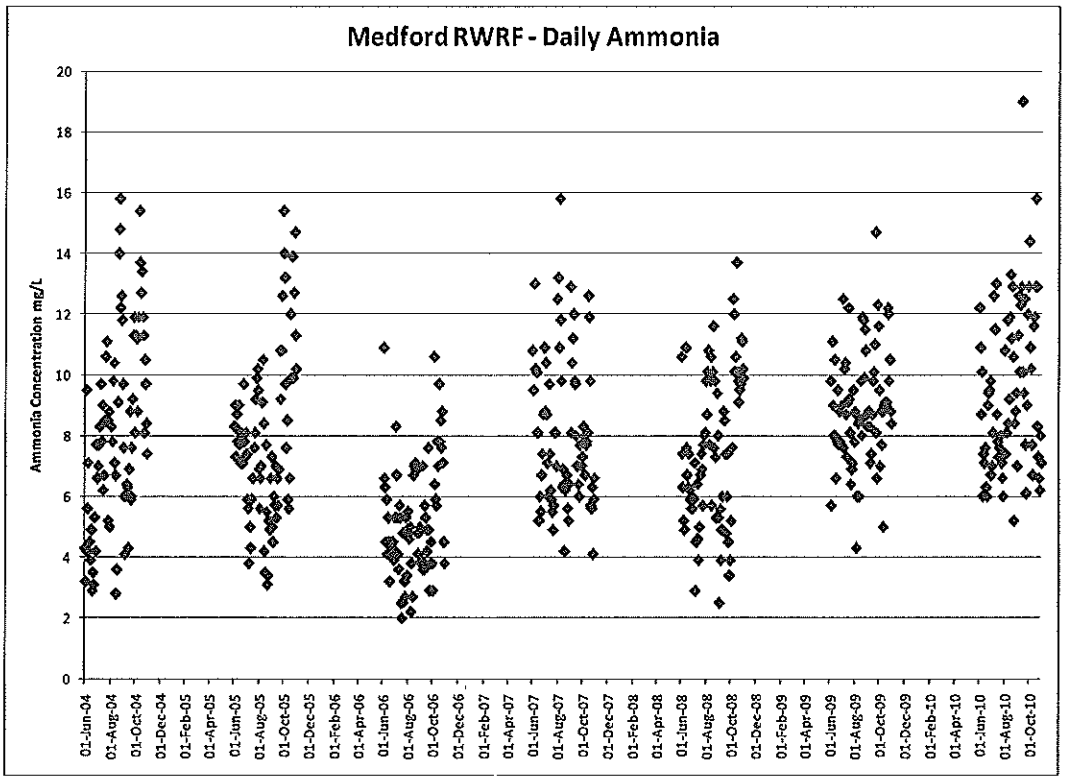
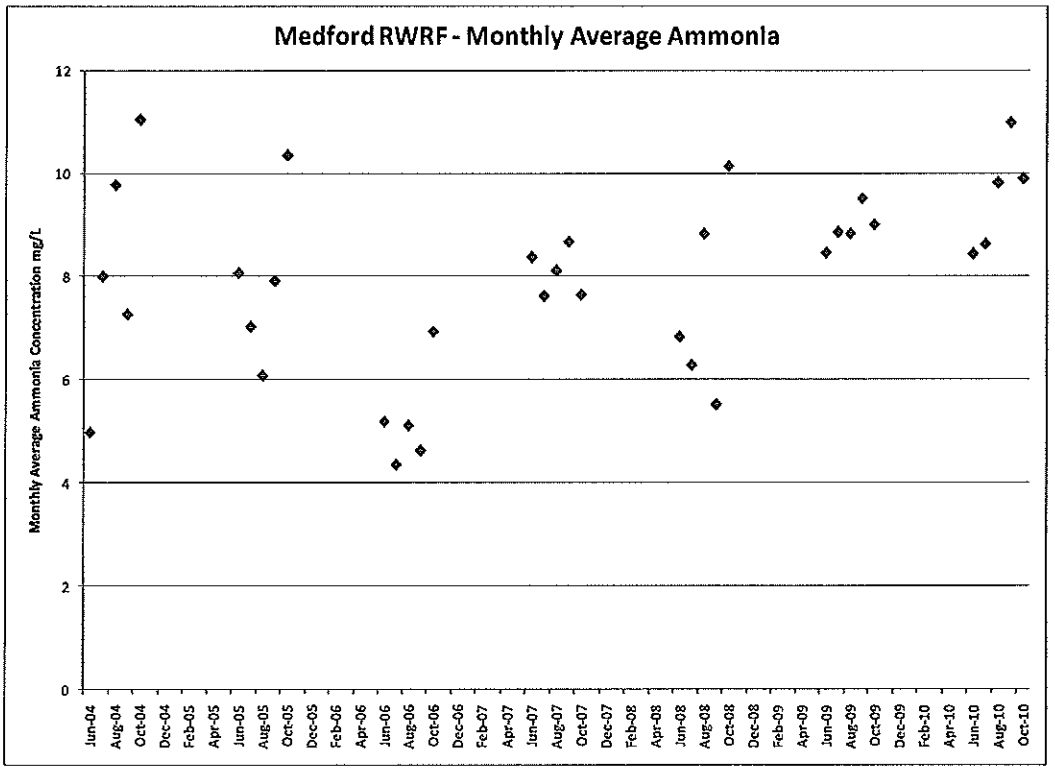


Figure 5-2: Medford RWRF Monthly Average Ammonia Levels



The ammonia RPA performed as part of the previous permit renewal used a limited amount of data. Also, as discussed above, the CORMIX model has been improved to allow for better dilution predictions of fanned multiport diffusers. This new information allows DEQ to better evaluate the potential for ammonia toxicity. Using this new information, the effluent ammonia limits would be less stringent than the existing permit limits (see Appendix B1, p. 51). Section 402(o) of the Clean Water Act generally prohibits renewing permits with less stringent effluent limits. Therefore, since the Medford RWRF can meet the existing limits, DEQ proposes to renew the permit with the same ammonia limits as in the existing permit.

The previous permit also stated that DEQ was in the process of revising the ammonia criteria, that the ammonia limits are based on the criteria at that time (2002), and that the limits are considered interim. On June 2, 2003, DEQ proposed revisions to OAR 340-041. After public comments were received and responded to, these revisions were adopted by the Oregon Environmental Quality Commission (EQC) on May 20, 2004, and filed with Oregon Secretary of State on May 28, 2004. DEQ submitted these revisions to the EPA for review and approval on July 8, 2004. On May 29, 2008, a U.S. District Court in the District of Oregon issued a consent decree setting forth deadlines by which the EPA must take action, under Section 303(c) of the CWA, on Oregon's July 8, 2004 submission to the EPA. The court subsequently issued several extensions of the applicable deadlines for action. To date, the EPA has not taken action on DEQ's revisions to the ammonia criteria.

5.3.1.2 Chlorine

Chlorine is a strong chemical oxidizer that is toxic to many aquatic organisms. Its oxidizing properties also make it an effective disinfectant. Wastewater treatment plants, for example, often use it to kill bacteria in their effluent before discharging into waters of the state. The fresh water criteria for chlorine were used both for the reasonable potential analysis and to calculate permit limitations. According to OAR 340-41, Table 20, chlorine concentrations of 11 µg/L (0.011 mg/L) can result in chronic toxicity in fresh waters while 19 µg/L (0.019 mg/L) can result in acute chlorine toxicity in fresh waters. Compliance with acute toxicity criteria is required at the edge of the Zone of Immediate Dilution (ZID) and compliance with chronic toxicity criteria is required at the edge of the mixing zone. The existing permit contains the following total chlorine residual limit:

> Shall not exceed a monthly average concentration of 0.02 mg/L and a daily maximum concentration of 0.04 mg/L.

The Medford RWRF uses chlorination for disinfection and dechlorination for compliance with in-stream water quality toxicity standards for chlorine. Except of one equipment failure in July 2006, the Medford RWRF has consistently met the chlorine effluent limits. Using this new information, the effluent chlorine limits would be the same as the existing permit limits (see Appendix B1, p. 51). Therefore, DEQ proposes to renew the permit with the same chlorine limits as in the existing permit.

5.3.2 Reasonable Potential Analysis

The EPA has developed a methodology called Reasonable Potential Analysis (RPA) for determining if there is a reasonable potential for a discharge to cause or contribute to violations of water quality standards. A RPA takes into account effluent variability, available dilution (if applicable), receiving stream water quality, aquatic health water quality standards, and human health water quality standards.

DEQ has adopted the EPA's methodology for RPA. If the RPA results indicate that there is a potential for the discharge to cause or contribute to exceedance of water quality standards, the methodology is then used to determine permit limits for the discharge so as to *not* cause or contribute to violations of water quality standards.

DEQ requires that NPDES permittees discharging more than 1 MGD conduct extensive toxicity tests on their effluent. The testing aims at determining whether the effluent contains toxic concentrations of specific substances (metals, cyanide, phenols, volatile organics, acid extractables, and base neutrals) as well as whether the effluent as a whole may have toxic effects on aquatic life.

As required by the existing permit, the Medford RWRF conducts quarterly monitoring of arsenic, cadmium, chromium, copper, cyanide, mercury, molybdenum, nickel, lead, selenium, silver, and zinc. These tests consist of 24-hour composite samples over three days. All data passed quality analysis and quality control. However, the metals concentrations in the effluent samples collected on 5/13/2008 appear high when compared to the results from all other

samples, including those collected on 5/14/2008 and 5/15/2008. Additionally, the effluent concentrations are more consistent with the influent concentrations on that day. While it is possible that the anomaly is due to a plant upset, it is more likely due to a sampling procedural error or laboratory error. Therefore, the data from 5/13/2008 is not used in this evaluation.

The Medford RWRF also conducts annual priority pollutant scans for organic pollutants. The facility conducted 4 sampling events in 2007 using super clean sampling procedures and laboratory analysis methods with lower detection levels. With the exception of the 5/13/2008 data, the data from 2006 through first quarter 2011 was used in the aquatic toxicity RPA spreadsheet (see Appendix B2, p. 52).

The aquatic toxicity RPA evaluation indicates that there is a no reasonable potential for the discharge to cause or contribute to an excursion above the water quality criteria for copper, lead, mercury, silver, zinc, and cyanide at the edge of the defined mixing zone and ZID, and for all other pollutants at the end of pipe. There was, however, a very limited amount of data on the background concentration of mercury. DEQ's LASAR database only contained 2 data points which were both non-detect at 0.5 mg/L. The Medford RWRF collected one sample on September 7, 2010, which was 0.87 ng/L (0.00087 µg/L). While this value was used in the evaluation, it is recommended that additional background mercury sampling be conducted.

The human health RPA evaluation indicates that, except for arsenic, there is a no reasonable potential for the discharge to cause or contribute to an excursion above the water quality criteria for nickel and chloroform at the edge of the defined mixing zone, and for all other pollutants at the end of pipe (see Appendix B3, p. 53). While there is no information on the background concentrations of chloroform in the receiving stream upstream of the treatment plant, the LASAR database contains several data points in the Rogue River upstream of the City of Gold Hill's drinking water system intake. All these were below detection limits. Therefore, an assumed value of 0.1 µg/L was used in this evaluation. The proposed permit contains a requirement to collect additional background chloroform data.

5.3.2.1 Arsenic

On April 21, 2011, the Environmental Quality Commission approved revisions to Oregon's water quality criteria for arsenic. These revisions better reflect the more toxic speciation's of arsenic (inorganic arsenic) using a regionally appropriate health-risk calculation method. This will result in a shift of the standard from "total" to the "inorganic" fraction, re-evaluation to better reflect regional health risks, and add an arsenic reduction policy. While these revisions are not applicable until approved by the EPA, the revisions were based on a fish consumption rate of 175 grams per day, the same rate as being used to revise Oregon's other human health criteria. The revised criteria are 2.1 µg/L inorganic arsenic for both the fish consumption (only) and the water and fish ingestion criteria. DEQ's LASAR database contains no information on inorganic arsenic in the Rogue River. However, in 2010 DEQ monitored for total recoverable arsenic at the Dodge Bridge in March, May, July, September, and November. The maximum, minimum, and average values were 0.38, 0.30, and 0.34 µg/L, respectively. The Medford RWRF collected arsenic data in the Rogue River from the Medford Water Commission intake in September 2010.

This total arsenic was 0.592 µg/L and the inorganic arsenic was 0.550 and 0.534 µg/L. Using this data in RPA spreadsheet shows that the maximum potential arsenic concentration at the edge of the mixing zone is 0.613 µg/L. This is well below the revised criteria. Therefore, there is no reasonable potential for the Medford RWRF effluent to exceed the revised criteria.

Given these imminent changes, the facility is being directed to ensure that current treatment facilities are being operated at the highest and best extent practicable and that they implement an interim monitoring and source control strategy to collect the necessary data to implement the new standard during the next permit cycle.

The facility has conducted a preliminary source investigation of all industrial users to ensure that no permitted significant industrial users discharge process wastewaters that contain arsenic as a process byproduct. There are no federally mandated "Technology-Based Effluent Limits" for arsenic for any of the industrial users in the system. There are no aquatic toxicity criterion for total arsenic and discharges are well below the aquatic toxicity criteria for Arsenic III (190/360 ug/L). The facility is a domestic activated sludge facility, which effectively removes some sediment-based arsenic and incorporates a small percentage of dissolved arsenic in the sludge. Based upon calculations using past monitoring data, the anticipated limit of operational performance for the facility is 2.5 µg/L of total arsenic. The Medford RWRF conducted one sampling event for inorganic arsenic that indicates that 50 to 60% of the total arsenic is inorganic. For the purposes of DEQ's arsenic interim implementation procedure and this permit, the current processes will be considered the "Best Available Treatment" and the requirement for the facility to continue to operate these processes at the "highest and best extent practicable" is in the proposed permit. As a performance measure, if the quarterly average concentrations of total arsenic exceed 2.5 µg/L, the facility will be required to submit a report to DEQ detailing the conditions that lead to the exceedance. DEQ will use the report, monitoring information and operational records to determine if the facility failed to comply with the narrative operational requirements.

The "monitoring strategy" will require that the facility perform the following steps:

- The permit will include the requirements (in Schedule D) for the facility to develop and submit for approval, within 60 days, an additional Arsenic Quantification Plan showing how the facility will collect ambient and effluent data to identify the source and speciation of arsenic, and to quantify the mass loading of arsenic. This will include proposed sample locations, frequency, seasonality data sources, analytic methods and applicable quantification limits. This is not a monitoring requirement imposed under 40 CFR 122.21 (j) or (g), although any required monitoring data may be used the data collection elements of the plan.
- The permit will require that the facility begin implementation of the approved plan within two weeks of DEQ approval.
- After 2.5 years (mid-permit term), DEQ intends to confer with the facility with the purpose of evaluating the collected data to determine if there might be an affirmative Reasonable Potential Analysis (RPA) finding for the applicable arsenic (total/inorganic) criterion.

- If the preliminary data indicates the potential for an affirmative RPA finding, the Medford RWRF will develop a management strategy to ensure compliance by the end of the permit period or approved compliance schedule. The facility will have the remainder of the permit cycle to collect any additional data to support the management strategy and undertake any required administrative actions (for example, a variance, site-specific criterion, compliance schedule, or permit modification).
- Upon approval of the revised inorganic arsenic criterion, if the preliminary data indicates a negative RPA finding, the facility may conclude any monitoring or compliance requirements to address the narrative arsenic effluent limits or benchmarks.
- DEQ will notify the permittee of the RPA findings via written memorandum and include a copy into the file.

These interim requirements are only applicable until the EPA takes action on the proposed revisions. The interim limits and monitoring conditions will sunset upon the EPA approval of the revisions.

5.3.2.2 Temperature

Water temperature affects the life cycles of aquatic species and is a critical factor in maintaining and restoring healthy salmonid populations. The purpose of the temperature criteria in OAR 340-041-0028 is to protect designated, sensitive, beneficial uses (including salmonid life cycle stages) from adverse warming caused by human activities.

WLAs are directly converted into thermal effluent limits because the Medford RWRF collects continuous temperature data, removing the uncertainty typically associated with periodic effluent monitoring. Per the Rogue Basin TMDL, the Medford RWRF's WLAs (H_{WLA}) are calculated using the equation below:

$$H_{wla} = (\Delta T)(Q_e + Q_r)C_f$$

Where,

H_{wla} = Waste Load Allocation heat load, million kcal/day
ΔT = allowable temperature increase, °C
Q_e = effluent flow rate, ft^3/sec
Q_r = river flow rate, upstream, ft^3/sec
C_f = conversion factor, 2.446 million kcal-s / °C·ft^3·day

As discussed above, Medford is allowed a 0.1772 °C increase in river temperature (ΔT). Per OAR 340-041-0028(12)(d), an exceedance of the temperature criterion will not be considered a permit violation during stream flows that are less than the 7Q10 flows. Therefore, when the receiving stream is at or less than the 7Q10 flows, the permit limit is based on the wasteload allocation at the 7Q10 flow. The nearest upstream USGS gage is 14339000 Rogue River at Dodge Bridge, near Eagle Point, which is located about 8.1 miles upstream of the Medford RWRF. The largest tributary between this gage and the Medford RWRF is Little Butte Creek.

The following table shows the critical low flow at the Dodge Bridge gage, Little Butte Creek and the Medford RWRF.

Table 5-1: Estimated Critical Low Flow at Medford RWRF

Time Period	Rogue River 7Q10 (Qr) (CFS)	Little Butte Creek 7Q10 (CFS)	Est. 7Q10 (CFS) at Medford RWRF	WLA based on Est. 7Q10 (million Kcals/day)
Apr 1 – May 15	1110	43.5	1154	513
May 16 – May 31	1710	17.6	1728	762
Jun 1 – Jun 15	1720	19.5	1740	768
Jun 16 – Jun 30	1480	9.72	1490	659
Jul 1 – Aug 31	1430	8.46	1438	637
Sep 1 – Sep 15	1473	10.6	1484	657
Sep 16 – Sep 30	985	22.7	1008	450
Oct 1 – Oct 15	986	23.2	1009	451
Oct 16 – Oct 31	901	54.5	956	428

The following equation is used to calculate the excess thermal load:

$$ETL = Q_E(T_E - T_R)C_f$$

Where:

ETL = Excess Thermal Load, million Kcals/day
Q_E = 7-day average effluent flow, cfs
T_E = 7-day average of the daily maximums effluent flow, °C
T_R = the applicable criterion, °C
C_f = conversion factor (2,446,665) $\frac{kcal \cdot s}{°C \cdot ft^3 \cdot day}$

The applicable criterion is either the biologically–based numeric criterion or the natural thermal potential, whichever is greater. The TMDL determined the natural thermal potential of the Rogue River at the Medford RWRF in two week intervals. A summary of the applicable criteria are presented in the table below.

Table 5-2: Applicable Temperature Criteria from Rogue Basin

Time Period	Biologically-Based Numeric Criterion (°C)	NTP (°C)	Applicable Criterion (°C)
Apr 1 – May 15	13.0	9.3	13.0

Time Period	Biologically-Based Numeric Criterion (°C)	NTP (°C)	Applicable Criterion (°C)
May 16 – May 31	13.0	13.5	13.5
Jun 1 – Jun 15	13.0	16.5	16.5
Jun 16 – Jun 30	16.0	16.7	16.7
Jul 1 – Aug 31	16.0	19.4	19.4
Sep 1 – Sep 15	16.0	17.9	17.9
Sep 16 – Sep 30	13.0	15.5	15.5
Oct 1 – Oct 15	13.0	13.6	13.6
Oct 16 – Oct 31	13.0	11.4	13.0

The ETL is based on a rolling seven-day average of daily maximums. Therefore when the ETL is calculated, compliance will be evaluated starting on the seventh day of each TMDL period. The following table compares the critical low flow (7Q10) WLA to the critical low flow ETL based on design average dry weather design flow (20 MGD) and the maximum 7-day average effluent temperature for each period from the 2004 – 2010 data.

Table 5-3: Estimated Critical Low Flow ETL

Time Period	T_E	T_R	ETL (million Kcal/day)	WLA - ETL (million Kcal/day)
Apr 1 – May 15	19.24	13	463	50
May 16 – May 31	20.32	13.5	506	256
Jun 1 – Jun 15	21.22	16.5	358	410
Jun 16 – Jun 30	22.51	16.7	427	232
Jul 1 – Aug 31	24.77	19.4	408	229
Sep 1 – Sep 15	24.52	17.9	479	178
Sep 16 – Sep 30	23.63	15.5	628	(178)
Oct 1 – Oct 15	22.98	13.6	704	(253)
Oct 16 – Oct 31	22.17	13	695	(267)

The table above shows that, during critical low flow, the discharge from the Medford RWRF has the potential to exceed the excess thermal load limit from mid September through October. The

most critical time is late October, when the ETL could exceed the ETL limit by as much as 267 million kilocalories per day (Kcal/day).

The above calculations are based on 2010 data. The Medford RWRF is in the process of developing a wastewater facilities plan. The draft facilities plan projects average dry weather flows of 21 MGD and 25 MGD in 2020 and 2030, respectively. For the 2020 flow, the projected ETL during the last two weeks in October is 729 million Kcal/day. Since the ETL Limit for this period is 428 million Kcal/day under 7Q10 conditions, the projected 2020 ETL is 301 million Kcal/day above the limit. For the 2030 flow, the projected ETL during the last two weeks in October is 868 million Kcal/day under 7Q10 conditions, which is 440 million Kcal/day above the limit.

DEQ may consider a loan of the reserve capacity until such time as it is needed for new or expanded facilities; however there is insufficient reserve capacity to cover Medford's need. The reserve capacity is 0.05°C, which equates to 121 million Kcal/day under 7Q10 conditions. As discussed above, the current ETL need 267 million Kcal/day. Therefore, a loan of reserve capacity would not meet the current and future ETL deficiencies during the most critical condition.

Protecting Cold Water – Spawning
The temperature rule (OAR 340-041-0028(11)) contains restrictions on point source discharges into salmon and steelhead spawning waters that are below the 13°C spawning criterion. The rule states the ambient water temperature may not be warmed by more than 0.5°C if background temperatures are between 10 and 12.8 °C or warmed by more than 1.0°C if background temperatures are less than 10°C. While the spawning period is from September 15 – June 15, the TMDL addresses the period of impairment from April 1 through October 31. Therefore, the cold water protection criteria apply November 1 through March 31. The average temperatures in the Rogue River at Dodge Bridge are less than 10°C from November through March. The months of November and December are assumed to be the most critical time period that is not addressed by the TMDL. The 7Q10 flow during this time is 906 cfs and the 60-day average temperature is 7.1°C (USGS Gage Dodge Bridge). The 60-day average effluent temperature and flows are 17.25 C and 31 MGD (from 2004 through 2010 DMR data). This information was used to assess impacts during the cold water period (see Appendix C1, p. 55). Based on this analysis, there is no reasonable potential for the effluent to impair cold water habitat from November through March.

5.3.3 Reasonable Potential Analysis Summary

The above reasonable potential analysis indicates that, which the exception of the current human health criteria for arsenic (0.0022 µg/L), there is no reasonable potential for the discharge to cause or contribute to toxic pollutant concentrations above the water quality criteria outside of the regulatory mixing zone. DEQ has promulgated revised human health criteria for arsenic (2.1 µg/L) and there is no reasonable potential for the discharge to exceed this criterion. Additional ambient monitoring is needed for chloroform because background concentrations are unknown and this analysis indicates that there is a potential to exceed the human health criterion at the end of pipe.

Thermal load limits are needed to comply with the requirements of the Rogue Basin TMDL.

5.4 Thermal Load Limits

5.4.1 Evaluation of Compliance Options

During the development of the Rogue Basin TMDL, the Medford RWRF became aware that the existing wastewater facilities would not be able to meet its proposed wasteload allocation (WLA) and developed alternatives to meet its WLA as part of the facilities planning effort mentioned above. The six alternatives evaluated and their feasibility are summarized in the table below.

Table 5-4: Alternatives Evaluated for Compliance with Thermal Load Limit

Alternatives	Description	Feasibility
Internal plant changes	Reduction of heat inputs from various machinery located at the plant (for instance, heated cooling water from the digester gas engine is discharged into the effluent). Installing shade over tanks to reduce radiant heat was also considered.	Insufficient cooling to meet WLA
Evaporative cooling	Cooling ponds, spray ponds, and cooling towers.	Insufficient cooling to meet WLA
Effluent recycling and reuse	Land irrigation of effluent	Insufficient cooling to meet WLA because irrigation need during October is absent
Effluent chillers	Mechanical refrigeration units that would cool effluent below ambient and wet-bulb temperatures by mechanically pumping water through a vapor-compression or absorption refrigeration cycle	Sufficient cooling feasible
Effluent storage	Effluent discharged into the river during the later summer season is reduced by storing effluent in a large holding basin; stored effluent discharged to river after October 31st when permit temperature requirements are not in effect	Sufficient cooling feasible
Temperature trading	Restoration of bank vegetation to increase shading over water bodies to prevent warming in the watershed in lieu of reducing thermal load at the plant outfall	Restoration opportunities available

The three feasible alternatives, chillers, effluent storage, and trading, were further evaluated based on operability, effectiveness, reliability, flexibility, energy consumption, public and regulatory acceptability, regulatory compliance, and risk control. Using these criteria, effluent chillers scored the lowest, with the highest energy consumption and lowest perceived public acceptance. While effluent storage offers improved flexibility by allowing the plant to divert flows to storage, it is a higher energy consumption alternative to temperature trading. Temperature trading also has the lowest estimated cost at $5.1 million (versus $15 million for

effluent storage). Based on this evaluation, the draft facilities plan recommends the temperature trading alternative.

5.4.2 Proposed Thermal Credit Trading Program

The Medford RWRF has submitted a written proposed thermal credit trading program for DEQ approval (see Attachment #3). DEQ has reviewed this proposal and finds that it is consistent with DEQ's "Water Quality Trading in NPDES permits Internal Management Directive" (Trading IMD). The public will be given notice of the trading program and an opportunity for comment concurrently with the public comment period for the draft permit renewal. Upon completion of the public review process, the credit trading program proposal will be incorporated into the permit by reference and the Medford RWRF's trading activities would be allowed. Because the public will be given the opportunity to review and comment on the proposed trading program before it becomes part of the permit and permit requirements governing trades, public notice of individual trades made during the course of implementing the approved trading program is not required.

Once the trading program is approved, the Medford RWRF may trade their point source thermal load with non-point source thermal load within the Rogue River watershed above the point of maximum impact. The Rogue Basin TMDL determined that the maximum impact occurs at approximately river mile 62. Land ownership in this area is mostly private.

The protocols for temperature trading by riparian shade restoration are detailed in the Trading IMD, Appendix A. The following equation is used to calculate the thermal load credit from riparian shade projects for a specific reach of stream. This calculation should be done approximately every 50 meters (165 feet) along the stream reach:

$$Thermal\ Credits = \frac{\text{SAstream} \times \Delta\text{ES} \times \text{IR}}{\text{TR}}$$

Where:

- SAstream, stream surface area = average stream width x stream length
- ΔES, increase in effective shade = estimated effective shade after planting - estimated effective shade before planting
- IR, incident solar radiation (insolation) rate = the amount of solar radiation energy received
- TR, trading ratio = 2

To obtain thermal credits, a written planting plan is required for each project. DEQ will not publically notice or receive public comment on individual trades. The proposed permit specifies the requirements of the planting plan in Schedule D. Credits for specific riparian shade restoration projects may be used as soon as the planting has been accomplished according to the planting plan. The sum of all thermal credits obtained must be reported on the monthly discharge monitoring reports.

To assess whether the Medford RWRF is in compliance with the trading provisions, the proposed permit contains an annual reporting requirement that requires:

1. Summary descriptions of trades, including:
   a. Whether credits were generated by Medford RWRF's activities or purchased; and
   b. How credits were used (for example, applied towards compliance with waste discharge limitations, sold, etc.).
2. A progress update relative to the interim goals defined for the trading program (for example, status of plantings).

5.4.3 Compliance Schedule

On June 14, 2011, DEQ formally informed the Medford RWRF that DEQ had completed an analysis of proposed revised excess thermal loads. This evaluation confirmed that the current treatment facilities are incapable of meeting these revised limits, acknowledged Medford RWRF's preference for water quality trading, and informed the Medford RWRF of the information needed for DEQ to include a compliance schedule in the permit. On June 20, 2011, the Medford RWRF responded with a proposed water quality trading plan and a request for a compliance schedule. During a phone call on June 23, 2011, DEQ informed the Medford RWRF that the compliance schedule request was incomplete. On June 27, 2011, the Medford RWRF submitted a revised request for a compliance schedule. DEQ requested clarification of information in the facilities plan and the Medford RWRF responded with an email on July 29, 2011. With this additional information, the Medford RWRF has provided all the necessary information to justify a compliance schedule (see Appendix D, p. 57).

5.4.3.1 Interim Limits

The Clean Water Act requires that state-issued individual NPDES permits include effluent limits as stringent as necessary to meet water quality standards. A permittee may not be able to immediately comply with new or newly applied water quality-based effluent limits upon the effective date of its permit because the permittee needs time to perform substantial modifications to their facility or processes in order to meet the new limits. Depending upon the circumstances, NPDES permits may include a series of required steps and deadlines (that is, a compliance schedule) for the permittee to meet its water quality-based effluent limits (see 40 CFR § 122.47 and OAR. 340-041-0061(16)). Interim effluent permit limits may also be included in certain circumstances to ensure that progress is being made.

The Medford RWRF's initial proposed schedule for obtaining thermal credits (June 27, 2011) was based on an initial start up period (2012 – 2014) followed by shading improvements in two-year increments (15%, 20%, 25%, and 20%) and used critical case calculations provided by DEQ in writing on June 14, 2011. DEQ worked with Medford RWRF on this proposal to incorporate revised critical case calculations and develop more concrete milestones as directed by DEQ's Compliance Schedule IMD. DEQ revised critical flow calculations by using additional flows from Little Butte Creek and a 2020 projected flow rather than an annual 7Q10 and 2010 design flow. As a result, DEQ is proposing interim limits based on the 2020 projected heat load (729 million Kcal/day at the October 7Q10 critical case low flow, which equates to $\Delta T = 0.2923°C$) and then decreasing over time to the final limit ($\Delta T = 0.1772°C$, which equates to 428 million Kcal/day at the October 7Q10 critical case low flow). These interim limits are lower than the

initial limits proposed by the Medford RWRF and in four-year increments rather than two to allow Medford more flexibility in meeting the more aggressive schedule.

Table 5-5: Interim Excess Thermal Load Limits

Period	Initial Proposal for Interim ETL Limits (million Kcals/day)		Final Proposal Interim ETL Limit (million Kcals/day)
Until November 1, 2014	0.3232°C x (Qe+Qr) x Cf		0.2923 °C x (Q_e + Q_r) x C_f
	Until November 1, 2016	0.3013°C x (Qe+Qr) x Cf	
Until November 1, 2018	0.2692°C x (Qe+Qr) x Cf		0.2485 °C x (Q_e + Q_r) x C_f
	Until November 1, 2020	0.2371°C x (Qe+Qr) x Cf	
Until November 1, 2022	0.2064°C x (Qe+Qr) x Cf		0.2193 °C x (Q_e + Q_r) x C_f
After November 1, 2022	0.1772 °C x (Q_e + Q_r) x C_f		0.1772 °C x (Q_e + Q_r) x C_f

The interim limits will result in the following thermal load reductions.

Table 5-6: Calculated Interim Thermal Load Reductions

Years	Reduction	Interim Load Calculation
2011-2014	Start up, based on current loads	ΔT = 0.2923
2015 - 2018	15% of total reduction	ΔT = 0.2485
2019 - 2022	60% of total reduction	ΔT = 0.2193

5.4.3.2 Compliance Milestones

DEQ is proposing compliance milestones that require the Medford RWRF to demonstrate continuous progress in meeting its WLA. At least one riparian restoration planting must be completed each year and a minimum quantity of thermal credits must be obtained to ensure compliance during a mild drought year (177 million Kcals/day at the annual 7Q5 condition). A four-year period is provided to comply with the milestones to account for the fact that success in obtaining project sites will vary from year-to-year and the full amount of thermal credits will only be needed during drought years. Medford may use other methods to reduce thermal loads (for example, wetland cooling, recycled water use) should opportunities arise. The milestones are also in thermal credits obtained rather than river miles restored because thermal credits vary per river mile. The proposed compliance milestones as follows:

a. By December 31, 2011, permittee must execute the necessary contract with their trading partner. The trading partner is the entity who will assist the permittee in organizing all restoration and trading activities.
b. Beginning in 2012 and ending in 2022, permittee must complete planting of at least one project per calendar year.
c. By December 31, 2014, permittee must have obtained a total of at least 35 million kilocalories in thermal credits.
d. By December 31, 2018, permittee must have obtained a total of at least 88 million kilocalories in thermal credits.
e. By December 31, 2022, permittee must have obtained a total of at least 177 million kilocalories in thermal credits.

The proposed permit also contains conditions requiring notification of compliance or noncompliance with interim requirements within 14 days following each milestone and a reopener regarding conditions or mitigation measures imposed as a result of EPA's Endangered Species Act consultation with NMFS and USFW on DEQ's rule authorizing the use of compliance schedules.

5.4.4 Benefits of Extended Compliance Schedule

As discussed above, the Medford RWRF considered a range of compliance options to meet its thermal load limit. While the other options would result in compliance with the final thermal loading limit sooner than the 11-year schedule for riparian restoration, DEQ finds that the benefits of such a program to clearly outweigh those of the other, more expensive shorter-term options. These benefits include:

- Instream warming is reduced at levels that are twice what is required through cooling at the treatment plant outfall.
- Riparian shading prevents warming throughout the watershed year-round, whereas the other alternatives considered only cool effluent that warms a small section of the Rogue River as needed to meet the thermal waste load allocation (most likely in October). Year round riparian shading provides greater thermal reductions on an annual basis.
- Increase in vegetative buffers helps to remove pollutants from stormwater runoff.
- Riparian projects create and restore wildlife habitat.
- Public-private partnerships advance community-based restoration and conservation activities.
- The pace of restoration and conservation is increased by increasing the financial incentive for land stewardship.
- Resources and energy are conserved: concrete, steel, and electricity would not be needed to construct and operate cooling facilities.
- Greenhouse gases are reduced through plant growth and prevention of greenhouse gas emissions from effluent chillers and effluent storage. (The following table compares three alternatives using the EPA's Greenhouse Gas Equivalencies Calculator (http://www.epa.gov/cleanenergy/energy-resources/calculator.html). The total CO2 emissions calculation assumes that the effluent chillers or storage project would be online in 2015.)

Table 5-7: Estimated Greenhouse Gas Emissions

Option	Killowatt hours per year		Metric Tons CO2 per year		Total Metric Tons CO2	
	2020	2030	2020	2030	2020	2030
Effluent Chillers (drought year)	382,000	574,000	264	396	876*	4,500**
Effluent Chillers (average year)	222,000	413,000	153	285		
Effluent Storage	36,000	72,000	24.8	49.6	112	496

* Based on 1 drought year and 4 average years
** Based on 2 drought years and 13 average years

In addition, an extended schedule is warranted for the following reasons:

- Medford RWRF cannot appropriate funding to implement its temperature trading program until it is certain the project is approved by DEQ through the issuance of a final permit.

- Medford RWRF does not own most of the riparian property slated for restoration. As a result, it will take time to bring multiple landowners into its trading program.

- Medford RWRF carefully considered available restoration opportunities and the time needed to recruit and contract services with landowners. To develop the schedule and interim milestones, Medford RWRF collaborated with The Freshwater Trust, a not-for-profit organization with extensive experience in both river and stream restoration and working with landowners throughout Oregon.

- Water quality temperature trading is a new compliance tool and there is little history to draw upon; however, Medford RWRF's proposed schedule is consistent with DEQ's experience in the Tualatin subbasin. Clean Water Services, which currently implements the only NPDES temperature trading program in the United States, has averaged approximately five miles of restoration per year over the past seven years. While it is difficult to compare this result to the Medford RWRF schedule due to the significant differences between the two agencies and ecosystems, Clean Water Services does have a more mature restoration program and is a larger organization with more funding than the Medford RWRF. As a result, the Medford RWRF proposal to restore one mile during the first year of their program followed by three miles in future years is considered by DEQ to be reasonable and as short as possible. (Note: Clean Water Services cleans 60 million gallons of wastewater a day with four treatment plants located throughout the basin for more than 520,000 customers in urban Washington County. In comparison, the Medford RWRF cleans 20 million gallons of wastewater a day at one treatment plant for approximately 170,000 customers in a portion of urban Jackson County.

If experience shows the Medford RWRF can be reasonably expected to make faster progress in accumulating thermal trading credits, DEQ will consider shortening the proposed schedule upon permit renewal. Likewise, if experience shows the City is unlikely to accumulate the necessary

credits within a reasonable amount of time, DEQ will request that Medford reconsider other options for coming into compliance.

5.5 Whole Effluent Toxicity

In addition to analyzing the effluent for individual pollutants, the permittee also tested the effluent to determine its aggregate effect on aquatic organisms. These tests are known as whole effluent toxicity (WET) tests. Effluent samples are collected and aquatic organisms are subjected to various effluent concentrations in controlled laboratory experiments.

WET tests are used to determine the percentage of effluent that produces an adverse effect on a group of test organisms. The measured effect may be fertilization, growth, reproduction, or survival. The EPA's methodology includes both an acute test and a chronic test. An acute WET test is considered to show toxicity if significant mortality occurs at effluent concentrations less than that which is found at the edge of the zone of immediate dilution (ZID). A chronic WET test is considered to show toxicity if significant adverse affects occur at effluent concentration less than that which is known to occur at the edge of the mixing zone.

The EPA has developed WET test protocols using freshwater, marine, and estuarine test species. The EPA recommends running tests using an invertebrate, vertebrate, and a plant test organism. Organisms used in WET tests are indicators or surrogates for the aquatic community to be protected, and a measure of the real biological impact from exposure to the effluent. To protect water quality, the EPA recommends that WET tests be used in NPDES permits together with requirements based on chemical-specific monitoring.

The Medford RWRF conducted WET tests quarterly during 2003 and three times during 2007. The test organisms were *Ceriodaphnia dubia* (water flea), *Pimephales promelas* (fathead minnow), and *Raphidocelis subcapitata* (algae). The water flea tests showed no acute toxicity in any of the tests using 100% effluent. The fathead minnow tests were duel endpoint where the acute mortality results are derived from the chronic tests. All fathead minnow tests resulted in no statistically significant difference between the control and 100% concentrations except November 2003. The November 2003 fathead minnow tests resulted in no statistically significant difference between the control and 47.6% concentrations. Therefore, there would be no acute toxicity at the edge of the zone of immediate dilution (equivalent to 11.3% effluent concentration). In addition, the WET test showed no chronic toxicity at effluent concentrations equivalent to those at the edge of the mixing zone. The table below lists the no observed effect concentration (NOEC) from the WET tests performed:

Table 5-8: WET Test NOEC Results (% effluent)

Date	Water Flea	Fathead Minnow	Algae
February 2003	>100	47.6	>100
May 2003	47.6	47.6	>100
August 2003	>100	15	15
November 2003	15	47.6	7.7
February 2007	>100	47.6	47.6
May 2007	47.6	47.6	<3.0
August 2007	>100	47.6	>100

The equivalent effluent concentration at the edge of the mixing zone is 7%. Only the algae WET test in May 2007 showed toxicity at a lower effluent concentration.

With the revisions to the RPA IMD in 2005, DEQ changed the WET chronic criterion from NOEC to the IC_{25}. The IC_{25} is the concentration of effluent which has an inhibitory effect on 25% of the test organisms for the monitored effect, as compared to the control (expressed as % effluent). Dual endpoints for the water fleas were also added at that time. The following table lists the IC_{25} from the WET tests performed:

Table 5-9: WET Test IC_{25} Results (% effluent)

Date	Water Flea	Fathead Minnow	Algae
February 2003	>100	78.1	65.3
May 2003	66.2	52.2	65.5
August 2003	>100	60.5	40.9
November 2003	29.8	58.6	14.3
February 2007	65.7	84.4	64.9
May 2007	64.3	64.1	13.0
August 2007	>100	>100	86.8

All of the above WET tests show no chronic toxicity at the edge of the mixing zone.

5.6 Antidegradation / Antibacksliding

DEQ performed an antidegradation review for this discharge. Permit renewals with the same or more stringent discharge loadings as the previous permit, as in this case, are not considered to lower water quality from the existing condition. Based on the antidegradation review (see Appendix E, p. 59), DEQ determined that the proposed discharge complies with the antidegradation policy for surface waters found in OAR 340-041-0026.

6 Permit Draft Discussion

6.1 Face Page

The face page provides information about the permittee, description of the wastewater, outfall locations, receiving stream information, permit approval authority, and a description of permitted activities. The permittee is authorized to construct, install, modify, or operate a wastewater collection, treatment, control, and disposal system. The permit allows discharge to the Rogue River within limits set by Schedule A and the following schedules. It prohibits all other discharges.

In accordance with state and federal law, NPDES permits shall be effective for a fixed term not to exceed 5 years. Upon issuance, this permit will be effective for no more than 5 years.

DEQ evaluated the classifications for the treatment and collection systems (see Appendix F, p. 59). The treatment system is considered a Class IV system and the collection system is considered a Class IV system. DEQ is not proposing any changes to the system classifications.

6.2 Schedule A: Waste Discharge Limitations – Outfall 001 and 001A

6.2.1 Conventional Pollutants

The waste discharge limitations are based on the water quality standards of OAR 340-041 and the minimum design criteria of OAR 340-041-0275 (Rogue Basin). Also, Title 40 Code of Federal Regulations (40 CFR) Part 133 established the minimum federal secondary treatment requirements that must be achieved by treatment systems. This Part identifies monthly and weekly average concentration limits, monthly average percent removal efficiency limitations for both BOD/CBOD and TSS, and pH effluent limitations. As an NPDES delegated state, Oregon is required to implement this Part of the federal regulations. Therefore, these limitations are also incorporated into the draft permit.

No changes are proposed to the existing effluent limits for biochemical oxygen demand (BOD), total suspended solids (TSS), *E. coli* bacteria, total residual chlorine, pH, ammonia, and BOD/TSS removal efficiencies (see section 5.1, p. 18). As discussed above, DEQ is proposing to revise the excess thermal load limit in accordance with the Rogue Basin TMDL and require a technology-based narrative limit for arsenic. The arsenic limit will be in effect only until the EPA takes action on the revised arsenic criteria.

6.2.1.1 BOD_5/$CBOD_5$ and TSS concentration and mass limits

Biochemical Oxygen Demand (BOD) is exerted on natural streams by the biological activity. Food sources such as organic pollutants remaining in municipal effluent increase the biological activity and therefore increase the BOD while lowering in-stream dissolved oxygen.

Based on the Rogue Basin minimum design criteria, wastewater treatment resulting in a monthly average effluent concentration of 10 mg/L for BOD5 and TSS must be provided from May 1 - October 31. From November 1 - April 30, a minimum of secondary treatment or equivalent control

is required. Secondary treatment for this facility is defined as monthly average concentration limit of 30 mg/L for BOD5 (or 25 mg/L for CBOD5) and 30 mg/L for TSS in the existing permit. DEQ is proposing concentration limits at least as stringent as the basin minimum design criteria.

The proposed monthly average summer $CBOD_5$ and TSS concentration limits are 10 mg/L with a weekly average limit of 15 mg/L. The proposed monthly average winter BOD_5 and TSS concentration limits are 30 mg/L with a weekly average limit of 45 mg/L.

The summer mass limits for $CBOD_5$ and TSS are based on the design average dry weather flow (ADWF) of 20 MGD and the monthly average $CBOD_5$ and TSS concentration limits of 10 mg/L and 10 mg/L, respectively. The winter mass limits for the facility are be based on the AWWF of 25.3 MGD and the monthly average BOD5 or TSS concentration limits of 30 mg/L and 30 mg/L, respectively. Daily mass load limits do not apply of days when the daily flow exceeds 40 MGD (twice the design ADWF).

All mass load limitations have been rounded to two significant figures. The proposed limits are:

(1) June 1 - October 31:

Parameter	Average Effluent Concentrations		Monthly Average	Weekly Average	Daily Maximum
	Monthly	Weekly	lb/day	lb/day	lbs
$CBOD_5$	10 mg/L	15 mg/L	1700	2600	3400
TSS	10 mg/L	15 mg/L	1700	2600	3400

(2) November 1 – May 31

Parameter	Average Effluent Concentrations		Monthly Average	Weekly Average	Daily Maximum
	Monthly	Weekly	lb/day	lb/day	lbs
BOD_5	30 mg/L	45 mg/L	6300	9500	13,000
TSS	30 mg/L	45 mg/L	6300	9500	13,000

Calculations:

(1) Summer $CBOD_5$ and TSS
- (a) 20 MGD x 8.34 #/gal x 10 mg/L monthly avg. = 1700 lbs/day
- (b) 1700 lbs/day monthly avg. x 1.5 = 2600 lbs/day weekly avg.
- (c) 1700 lbs/day monthly avg. x 2.0 = 3400 lbs/day daily max.

(2) Winter BOD_5 and TSS

- (a) 25.3 MGD x 8.34 #/gal x 30 mg/L monthly avg. = 6330 lbs/day

(b) 6330 lbs/day monthly avg. x 1.5 = 9495 lbs/day weekly avg.
(c) 6330 lbs/day monthly avg. x 2.0 = 12,660 lbs/day daily max.

A review of recent monitoring data indicates the Medford RWRF should generally be able to comply with the permit limits. No changes are proposed from the previous permit limits for BOD_5 and TSS.

6.2.1.2 BOD and TSS Percent Removal Efficiency

A minimum level of percent removal for BOD5 (or CBOD5) and TSS for municipal dischargers is required by the Code of Federal Regulations (CFR) secondary treatment standards (40 CFR, Part 133). An 85% removal efficiency limit is included in the proposed permit to comply with federal requirements. An examination of the DMR data indicates the permittee will have little difficulty meeting the limit with the existing facilities.

6.2.1.3 pH Limits

The pH is a measure of how acidic or basic a solution is. At a pH of 7.0 s.u. the solution is considered neutral. The purpose of an in-stream water quality pH standard is generally the protection of aquatic life since most aquatic organisms can only tolerate a fairly narrow range around 7.0 s.u.

The Rogue Basin Water Quality Standard for pH is found in OAR 340-41-0275(1)(b). The allowed range is 6.5-8.5. The existing permit limits pH to the range of 6.0-9.0. This limit is based on Federal wastewater treatment guidelines for sewage treatment facilities, and is applied to the majority of NPDES permittees in the state. DMR data for the existing permit cycle was reviewed and effluent data met the permit limit and basin standards. DEQ evaluated pH using a spreadsheet that derives the pH at the mixing zone boundary (see Appendix B4, p. 54). Mixing with ambient water within the mixing zone will ensure that the pH at the edge of the mixing zone meets the ambient criteria. The proposed permit retains the limit for pH to the range 6.0 to 9.0. DEQ considers the proposed permit limits to be protective of the water quality standard.

6.2.1.4 Bacteria

The proposed permit limits are based on the E. coli standard contained in OAR 340-041-0009(5). The proposed limits are a monthly geometric mean of 126 E. coli per 100 mL, with no single sample exceeding 406 E. coli per 100 mL. If a single sample exceeds 406 E. coli per 100 mL, then the permittee may take five consecutive re-samples. If the log mean of the five re-samples is less than or equal to 126, a violation is not triggered. The re-sampling must be taken at four hour intervals beginning within 28 hours after the original sample was taken.

The proposed limits are taken directly from the Oregon bacteria rule which is found in OAR 340-041-0009. This rule establishes numeric in-stream water quality standards (OAR 340-041-0009(1)), establishes a prohibition against discharging raw sewage, establishes effluent limitations, and the methodology for establishing a violation (OAR 340-041-0009(5)). Regarding the general condition 6 found in Section B of Schedule F in this permit which prohibits overflows from wastewater conveyance systems, the Environmental Quality Commission (EQC) recognizes that it is impossible to design and construct a conveyance system that will prevent overflows under all storm conditions. The applicant is not seeking permit coverage for overflows

and the permit does not authorize such discharges. The State of Oregon has determined that all wastewater conveyance systems should be designed to transport storm events up to a specific size to the treatment facility. Therefore, in exercising its enforcement discretion regarding Sanitary Sewer Overflows, DEQ will consider the following:

1) Whether the permittee has conveyance and treatment facilities adequate to prevent overflows except during a storm event greater than the one-in-five-year, 24-hour duration storm from November 1 through May 21 and except during a storm event greater than the one-in-ten-year, 24-hour duration storm from May 22 through October 31. In addition, DEQ will also consider using enforcement discretion for overflows that occur during a storm event less than the one-in-five-year, 24-hour duration storm from November 1 through May 21 if the permittee had separate sanitary and storm sewers on January 10, 1996, had experienced sanitary sewer overflows due to inflow and infiltration problems, and has submitted an acceptable plan to DEQ to address these sanitary sewer overflows by January 1, 2010;
2) Whether the permittee has provided the highest and best practicable treatment and/or control of wastes, activities, and flows and has properly operated the conveyance and treatment facilities;
3) Whether the permittee has minimized the potential environmental and public health impacts from the overflow; and
4) Whether the permittee has properly maintained the capacity of the conveyance system.

DEQ will review the permittee's determination of the one-in-five-year, 24-hour duration winter storm and the one-in-ten year, 24-hour duration summer storm as described above in the permit holder's facilities plan. In the event that a permit holder reports an overflow event associated with a storm event and DEQ does not have information from the permit holder sufficient to determine whether or not the storm event exceeds storm events as specified in OAR 340-041-0009(6) & (7), DEQ will perform the determination using the information contained in Figure 26 of the 1973 NOAA Atlas 2 entitled "Precipitation-Frequency Atlas of the Western United States, Volume X – Oregon". This figure is entitled "Isopluvials of 5-yr 24-hr precipitation in tenths of an inch". The Atlas can be obtained on line at *http://hdsc.nws.noaa.gov/hdsc/pfds/other/or_pfds.html*; however the file is very large. A scanned version of Figure 26 is available at: *http://www.wrcc.dri.edu/pcpnfreq/or5y24.gif*. DEQ will compare the information in this figure with rainfall data available from the National Weather Service, or other source as necessary.

6.2.2 Existing Water-Quality Based Effluent Limits (WQBELs)

The existing permit contains water-quality based effluent limits (WQBELs) for ammonia and chlorine. No changes to the effluent limitations for ammonia and chlorine are proposed in the renewal permit.

6.2.3 New Water-Quality Based Effluent Limits (WQBELs)

The proposed permit contains new WQBELs for arsenic and thermal load as detailed in the following sections. For more information on DEQ analysis of these pollutants, see section 5.3.2, p. 22

6.2.3.1 Arsenic Limit

A technology-based effluent limit is proposed for total arsenic as follows: "Operate activated sludge treatment system at the highest and best extent practicable". DEQ has established a quarterly average 2.5 µg/L total arsenic as a non-regulatory numeric benchmark to use in assessing whether the applicable treatment technology is providing the highest and best practicable treatment for arsenic in the discharge. An exceedance of this average value shall not in itself constitute a violation of this permit, but DEQ will require the facility to submit a report to DEQ detailing the conditions that resulted in the elevated value. DEQ will use the report, monitoring information and operational records to assist in the determination of whether or not the facility was in compliance with the narrative operational requirements for total arsenic. The permittee must comply with this requirement until it can be determined by DEQ that the facility does not have the reasonable potential to exceed the anticipated water quality criterion or the end of the permit term. DEQ will notify the permittee via written memorandum and include a copy into the file.

These interim requirements are only applicable until the EPA takes action on the proposed revisions. The interim limits and monitoring conditions will sunset upon the EPA approval of the revisions. The proposed interim effluent limits are achievable through proper operation and maintenance.

6.2.3.2 Excess Thermal Load Limits

The proposed new ETL limits are as follows:

Table 6-1: Excess Thermal Load Limits

Time Period	Rogue River 7Q10[1]	Excess Thermal Load Limit (million Kcals/day)	
		Stream Flow < 7Q10	Stream Flow > 7Q10
Apr 1 – May 15	1154	513	Flow-based (see note below)
May 16 – May 31	1728	762	
Jun 1 – Jun 15	1740	768	
Jun 16 – Jun 30	1490	659	
Jul 1 – Aug 31	1438	637	
Sep 1 – Sep 15	1484	657	
Sep 16 – Sep 30	1008	450	

Time Period	Rogue River 7Q10[1]	Excess Thermal Load Limit (million Kcals/day)	
		Stream Flow < 7Q10	Stream Flow > 7Q10
Oct 1 – Oct 15	1009	451	
Oct 16 – Oct 31	956	428	

[1] - USGS gage is 14339000 Rogue River at Dodge Bridge, near Eagle Point **plus** USGS gage is 14348000 Little Butte Creek below Eagle Point, Oregon

ETL Flow-based Limit (*million Kcals/day)* = 0.1772 °C x (Qe + Qr) x C_f

Where: Q_e = *Effluent flow rate, 7-day average of the daily maximums, cfs*
Q_R = *River flow rate, USGS gage is 14339000 Rogue River at Dodge Bridge, near Eagle Point, cfs*
C_f = *conversion factor (2,446,665)* $\frac{kcal \cdot s}{^{\circ}C \cdot ft^3 \cdot day}$

6.3 Schedule B: Minimum Monitoring and Reporting Requirements

6.3.1 Monitoring Requirements

Schedule B describes the minimum monitoring and reporting necessary to demonstrate compliance with the conditions of this permit. The authority to require periodic reporting by permittees is included in ORS 468.065(5). Self-monitoring requirements are the primary means of ensuring that permit limits are being met. Other parameters may also need to be monitored when insufficient data exist to establish a limit, but where there is a potential for a water quality concern.

DEQ has developed a monitoring matrix for commonly monitored parameters that is based on size and complexity of facilities. Proposed monitoring frequencies are mostly based on this matrix and, in some cases, may have changed from the existing permit. The following table compares the monitoring requirements in the proposed permit with those in the existing permit and lists references for how the monitoring requirements in the proposed permit were developed:

Table 6-2: Comparison of Existing to Proposed Monitoring Requirements

Parameter	Minimum Frequency	Basis	Change from existing permit?
Influent			
Flow	Daily	Monitoring Matrix	No
Flow Meter Calibration	Quarterly	Monitoring Matrix	No

Parameter	Minimum Frequency	Basis	Change from existing permit?
BOD_5	3/Week	Monitoring Matrix	No
$CBOD_5$	3/Week	Monitoring Matrix	No
TSS	2/Week	Monitoring Matrix	No
pH	3/Week	Monitoring Matrix	No
Metals, cyanide, phenols and hardness	Quarterly using 3 consecutive days	Monitoring Matrix	Yes, new parameters and methods
Effluent			
BOD_5	3/Week (Nov-May)	Monitoring Matrix	No
CBOD5	3/Week (Jun-Oct)	Monitoring Matrix	No
TSS	3/Week	Monitoring Matrix	No
pH	Daily, continuous	Monitoring Matrix	Yes, change to continuous
E. coli	3/Week	Monitoring Matrix	No
Ammonia (NH3-N)	3/Week (Jun-Oct)	Monitoring Matrix	No
Quantity Chlorine Used (pounds)	Daily	Monitoring Matrix	No
Chlorine Residual	Daily	Monitoring Matrix	No
Pounds Discharged (TSS, BOD_5 (Nov-May) and $CBOD_5$ (Jun-Oct))	3/Week	Monitoring Matrix	No
Average Percent Removed (TSS, BOD_5 (Nov-May) and $CBOD_5$ (Jun-Oct))	Monthly	Monitoring Matrix	No
Toxics and related parameters:			
Whole Effluent Toxicity	Quarterly	Monitoring Matrix	No
Metals, cyanide, phenols and hardness (see Note 1)	Quarterly using 3 consecutive days	Monitoring Matrix	Yes, new parameters and methods

Parameter	Minimum Frequency	Basis	Change from existing permit?
Total and inorganic arsenic	Quarterly	Interim Arsenic Policy	Yes, new
Volatile, Acid-extractable and Base/Neutral compounds (see Note 1)	Twice per year for 2 years, September and February	RPA IMD	
Temperature:			
Temperature, Daily Maximum (deg. C)	Daily	Temperature IMD	No
Temperature, 7-day Average of Daily Maximums (April 1 through October 31)	Daily (as a rolling seven-day average starting April 7)	Temperature IMD	No
Excess Thermal Load (May 1 to Oct 31) (million kcal/day)	Daily (as a rolling seven-day average starting April 7)	Temperature IMD	Yes, different equations
Rogue River Flow	Daily	Temperature IMD	Yes, new
Thermal Credits (million kcal/day)	As credits are obtained	Temperature IMD	Yes, new
Solids Management			
For all anaerobically digested Class B biosolids land applied:			
Sludge analysis including: Total Solids (% dry wt.), Volatile solids (% dry wt.) Biosolids nitrogen for: NH_3-N; NO_3-N; & TKN (% dry wt.) Phosphorus (% dry wt.), Potassium (% dry wt.), pH (standard units)	Bimonthly when land applying	Biosolids IMD	No

Parameter	Minimum Frequency	Basis	Change from existing permit?
Sludge metals content for: Ag, As, Cd, Cr, Cu, Hg, Mo, Ni, Pb, Se & Zn, measured as total in mg/kg	Bimonthly when land applying	Biosolids IMD	No
Record of locations where biosolids are applied on each DEQ approved site. (Site location maps to be maintained at treatment facility for review upon request by DEQ)	Each Occurrence	Biosolids IMD	No
Record of % volatile solids reduction accomplished through stabilization	Monthly when land applying	Biosolids IMD	No
Record of digestion days (mean cell residence time)	Monthly	Biosolids IMD	Yes
For all sludge disposed of in a landfill			
Record of percent total solids and volume of all sludge disposed	Each Occurrence	Biosolids IMD	Yes
Recycled Water			
Total Flow (MGD) or Quantity Irrigated (inches/acre)	Daily	Recycled Water IMD	No
Flow Meter Calibration	Annually	Recycled Water IMD	No
Quantity Chlorine Used	Daily	Recycled Water IMD	No
Chlorine Residual	Daily	Recycled Water IMD	No
pH	2/Week	Recycled Water IMD	No
Total Coliform	Daily (Class A)	Recycled Water IMD	No
Turbidity	Hourly	Recycled Water IMD	No

Parameter	Minimum Frequency	Basis	Change from existing permit?
Nutrients (TKN, NO2+NO3-N, NH3, Total Phosphorus)	Quarterly	Recycled Water IMD	No
Receiving Stream			
Flow	Daily	Temperature IMD	Yes
Metals (including total and inorganic arsenic), cyanide, phenols and hardness (see Note 1)	Quarterly using 3 consecutive days	Monitoring Matrix	Yes, new parameters and methods
Volatile, Acid-extractable and Base/Neutral compounds (see Note 1)	Twice per year for first 2 years of permit, September and February	RPA IMD	Yes

The permittee is required to have a laboratory Quality Assurance/Quality Control program. DEQ recognizes that some tests do not accurately reflect the performance of a treatment facility due to quality assurance/quality control problems. These tests should not be considered when evaluating the compliance of the facility with the permit limits. Thus, DEQ proposes a statement in the opening paragraph of Schedule B recognizing that some test results may be inaccurate, invalid, or do not adequately represent the facility's performance and should not be used in calculations required by the permit.

6.3.2 Reporting Requirements

6.3.2.1 Monthly Reporting

The proposed NPDES permit requires discharge monitoring results to be submitted monthly. Monthly reports must be submitted by the 15th day of the following month (including "no discharge" reports if any). This section of the proposed permit also contains procedures for reporting analytic results that are less than the quantitation level.

6.3.2.2 Annual Reporting

Section B.3 of the proposed permit contains annual reporting requirements for the following:

a. If recycled water is generated or used, a recycled water use report is due by January 15 of the following year.
b. An annual thermal credit trading program report is due by February 1 of each year.
c. If biosolids are land applied, biosolids use report is due by February 19th of the following year.
d. An inflow and infiltration reduction program report is due by August 1 of each year.

6.3.2.3 Other Report Submittals

Section B.4 of the proposed permit contains reporting requirements for the following:

A summary report of all laboratory analytic reports for a minimum of 8 quarters of the monitoring is due by March 1, 2014. DEQ will use this data to perform a RPA and determine what, if any, additional monitoring is needed. If DEQ's review indicates that there is a reasonable potential for the effluent to exceed any water quality criteria, DEQ will notify the Permittee and request that the Permittee prepare a plan to reduce the toxicity.

6.4 Schedule C: Compliance Schedule

The proposed permit contains the thermal load compliance schedule milestones discussed above, a condition that the permittee must provide written notice of compliance or noncompliance with interim requirements within 14 days following each milestone, and a reopener clause in the event that conditions or mitigation measures are imposed as a result of EPA's Endangered Species Act consultation with NMFS and USFW on DEQ rule authorizing the use of this compliance schedule.

6.5 Schedule D: Special Conditions

The proposed permit contains eleven special conditions concerning requirements for:

1. Operator certification,
2. Biosolids management,
3. Recycled water use,
4. Inflow and Infiltration (I/I) reduction,
5. Groundwater quality,
6. Arsenic quantification plan,
7. Whole Effluent Toxicity (WET) testing, and
8. Thermal credit trading program.

The following special conditions were removed from the proposed permit:

- Temperature Management Plan requirements, and
- A requirement to obtain DEQ approval prior to increasing the thermal load from the facility.
- Notification to DEQ Medford Office of a malfunction. This condition has been replaced with a condition in General Conditions, Schedule F (Conditions F.D.5 and F.D.6).
- A contingency plan for responding to spills. This condition has been replaced with a condition in General Conditions, Schedule F (Condition F.B.8).

6.6 Schedule E: Pretreatment Activities

The proposed permit requires the permittee to implement a pretreatment program and contains 14 conditions regarding the following:

1. Program Administration
2. Legal Authorities
3. Industrial Waste Survey
4. National Pretreatment Standards
5. Local Limits

6. Control Mechanisms
7. Compliance Monitoring
8. Slug Control Plans
9. Enforcement
10. Public Notice of Significant Noncompliance
11. Data and Information Management
12. Annual Pretreatment Program Report
13. Pretreatment Program Modifications
14. Implementation of 2005 EPA Streamlining Amendments to 40 CFR Part 403

6.7 Schedule F: NPDES General Conditions

These conditions are standard to all domestic NPDES permits and include language regarding operation and maintenance of facilities, monitoring and record keeping, and reporting requirements. A summary of the changes is as follows:

- There are additional citations to the federal Clean Water Act and CFR, including references to standards for sewage sludge use or disposal.
- There is additional language regarding federal penalties.
- Bypass language has been made consistent with the Code of Federal Regulations.
- Overflow language has been modified. Formerly the language stated that overflows in response to the five or ten year event would not violate the permit. Now it states that overflows are prohibited. DEQ will continue to exercise enforcement discretion with respect to overflows consistent with the provisions of the Bacteria Rule (OAR 340-041-0009).
- Reporting requirements regarding overflows have been made more explicit.
- Requirements regarding emergency response and public notification plans have been made more explicit.
- Language pertaining to duty to provide information has been made more explicit.
- Confidentiality of information is addressed.

7 Next Steps

7.1 Public Comment Period

The proposed NPDES permit will be made available for public comment for 35 days. Public notice and links to the proposed permit will be posted on DEQ's website, advertised in newspapers (major sources), and sent to subscribers to DEQ's pertinent public notice e-mail lists. A Public Hearing will be scheduled if requested by 10 or more people, or by an authorized person representing an organization of at least 10 people. If a public hearing is to be held, then an additional public notice would be published to advertise the public hearing.

7.2 Response to Comments

DEQ will respond to comments received during the comment period. All those providing comment will receive a copy of DEQ's response. Interested parties may also request a copy of DEQ's response. Once comments are received and evaluated, DEQ will decide whether to issue

the permit as proposed, make changes to the permit, or deny permit issuance. DEQ will notify the permittee of DEQ's decision.

7.3 Modifications to Permit Evaluation Report and Fact Sheet

Depending on the nature of the comments and any changes made to the permit as result of comments, DEQ may modify this permit evaluation report and fact sheet. DEQ may also choose to update the permit evaluation report and fact sheet through memorandum or addendum. If substantive changes are made to the permit, then an additional round of public comment may occur.

7.4 Issuance

DEQ mails the finalized, signed permit to the permittee. The permit is effective 20 days from the mailing date.

Appendix A: Groundwater Prioritization Worksheet

[NOTE: At the discretion of the permit writer and the applicant, the applicant may choose to bypass this step *and* the Preliminary Groundwater Assessment step and proceed directly to the Hydrogeologic Characterization. A record of this decision should be made on the following page.]

DOMESTIC WASTEWATER FACILITIES

***EXISTING* Wastewater and Sludge/Biosolids Impoundment Systems (confirm all statements given as true or false):**		
1. System (any or all of its individual impoundment components) does not leak excessively. (An **"excessively"** leaking lagoon system or cell may be defined as one that has been designed for subsurface infiltration, rarely or never needs to discharge, dries up in the summer, or contains rooted vegetation.)	(True)	False
2. System is not located in a Groundwater Management Area where an identified contaminant of concern (ie. nitrates) may be associated with domestic wastewater or sludge.	(True)	False
3. System is not located within 500 ft. of an existing public or private drinking water supply well, is not located within a designated Wellhead Protection Area, and all land within 500 ft. of the system is zoned such that no drinking water wells are likely to be installed in the future.	(True)	False
4. There are no **exceptional situations** under which the impoundment system may require further groundwater review to determine the likelihood of an adverse impact	(True)	False

***NEW* and *EXISTING* Wastewater and Sludge/Biosolids Land Application (confirm all statements given as true or false):**		
1. Application is in compliance with the "reuse" rules (or municipal sewage sludge application rules) and application rates are at or less than agronomic rates. (Note: Nominal leaching fractions may be considered to be in compliance with the "reuse" rules in some areas of the state such as parts of eastern Oregon where climate conditions indicate the need.)	(True)	False
2. There are no **exceptional situations** under which the impoundment system may require further groundwater review to determine the likelihood of an adverse impact.	(True)	False

[If *all* answers for a given facility type are true, then no further information is needed. Non-numerical groundwater limits should be included in the permit.

Appendix B1: Reasonable Potential Analysis for Ammonia and Chlorine

Facility Name: Medford RWRF **Date:** 8/9/2011

Dilution Values? (Y/N)	Y	calculated
Low Flow Dilution @ ZID (1Q10)	8.8	*
Low Flow Dilution @ MZ (7Q10)	14	*
Low Flow Dilution @ MZ (30Q5)	*	*
High Flow Dilution @ ZID (1Q10)	*	*
High Flow Dilution @ MZ (7Q10)	*	*
High Flow Dilution @ MZ (30Q5)	*	*
If no dilution values		
Enter flow rates here	Summer	Winter
Effluent Flow (MGD)	*	*
1Q10 (CFS)	*	*
7Q10 (CFS)	*	*
30Q5 (CFS)	*	*
% dilution at MZ	*	*
% dilution at ZID	*	*
probability basis (WLA multipliers)	99%	

Summer data	Effluent	Stream	Mixed ZID 1Q10	Mixed MZ 7Q10	Mixed MZ 30Q5	
pH * =	7.6	7.9	7.8	7.8	*	(6.5-9)
Temp * =	22.11	11.4	12.6	12.2	*	° C
Alkalinity =	150	35				
Salmonids Present? (Y/N)	n/a	Y				
Salmonid Spawning? (Y/N)	n/a	Y				
Fresh Water ? (Y/N)	n/a	Y				
Salinity	*	*	*	*		
Winter data						
pH * =	*	*	*	*	*	(6.5-9)
Temp * =	*	*	*	*	*	° C
Alkalinity =	*	*				
Salmonids Present? (Y/N)	n/a	*				
Salmonid Spawning (Y/N)	n/a	*				
Fresh Water ? (Y/N)	n/a	*				
Salinity	*	*	*	*		

	WATER QUALITY CRITERIA				Allocations				#	Acute	4 day	30 day	Min	Concentration Limits	
PARAMETER	1 Hour (CMC)	4 Day (CCC)	30 Day (CCC)	Back-ground	Acute	4 Day	30 Day	CV	Samples /Mo	LTA	LTA	LTA	LTA	95% Monthly	99% Daily
	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/L			mg/l	mg/l	mg/L	mg/l	mg/l	mg/l
Low Flow Season															
CHLORINE	0.019	0.011	n/a	0.01	0.09	0.02	n/a	0.6	30	0.03	0.01	n/a	0.01	**0.02**	**0.04**
AMMONIA - Freshwater	8.1	1.5	n/a	0.15	70.27	18.96	n/a	0.45	12	28.38	11.59	n/a	11.59	**14.2**	**28.7**
AMMONIA - Saltwater	n/a	n/a	n/a	*	*	*	n/a	*	*	*	*	n/a	*	*	*
AMMONIA - Proposed	8.1	*	*	*	*	*	*	*	*	*	*	*	*	*	*
High Flow Season															
CHLORINE	0.019	0.011	n/a	*	*	*	n/a	*	*	*	*	n/a	*	*	*
AMMONIA - Freshwater	n/a	n/a	n/a	*	*	*	n/a	*	*	*	*	n/a	*	*	*
AMMONIA - Saltwater	n/a	n/a	n/a	*	*	*	n/a	*	*	*	*	n/a	*	*	*
AMMONIA - Proposed	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

NOTES : Temperature must be between 0 and 30 ° C
pH must be between 6.5 and 9
Ammonia is mg/l ammonia as N.

Appendix B2: Reasonable Potential Analysis for Aquatic Toxicity Criteria

RPA Run Information	
Facility Name:	Medford RWRF
DEQ File Number:	55125
Permit Writer Name:	Jon Gasik
Outfall Number:	001
Date of RPA Run:	29-Apr-11
RPA Run Notes:	
KEY:	-- Intermediate calc.s
* Enter data here	-- Calculated results

Please complete the following General Facility Information		
1. Do I have dilution values from a mixing zone study? (Y/N)		Y
2. Is the receiving waterbody fresh water? (Y/N)		Y
3. If answered "N" to *Question 1*, then fill in the following table		
Eff. Flow Rate	MGD	*
Stream Flow: 7Q10	CFS	*
Stream Flow: 1Q10	CFS	*
% dilution at ZID	%	*
% dilution at MZ	%	*
Calculated dilution values		
Dilution @ ZID		na
Dilution @ MZ		na

4. If answered "Y" to *Question 1*, then fill in values from mixing zone study	
Dilution @ ZID (from study)	
Dilution @ MZ (from study)	
5. Please enter *Water Hardness Data* below t critical conditions (values from 25 to 400 mg/l)	
Effluent	mg/L $CaCO_3$
Up-stream	mg/L $CaCO_3$
ZID boundary	mg/L $CaCO_3$
MZ boundary	mg/L $CaCO_3$
6. Please enter statistical *Confidence* and *Prob* values (note: defaults already entered)	
Confidence Level	%
Probability Basis	%

Determine Monitoring Reqs.	Identify Pollutants of Concern					Determine In-Stream Conc.			Determine Reasonable P		
PARAMETER	Evaluation Required?	# of Samples	Highest Conc.	Coeffrcent of Varience	Estmated Max Eff. Conc.	Exceed WQ at end of pipe?	Ambient Conc.	Max Total Conc. at ZID	Max Total Conc. at RMZ	WQ CRITERIA 1 Hour (CMC)	WQ CRITERIA 4 Day (CCC)	Is there R Potential t (Y/
	(Y/N)		µg/l		µg/l	(Y/N)	µg/l	µg/l	µg/l	µg/l	µg/l	Acute
Table 1: Effluent Parameters for all POTWs w/a Flow > 0.1 MGD												
Ammonia (as N)	Yes	Evaluation occurs on Ammonia (NH3) spreadsheet page										
Chlorine (total residual, TRC)	Yes	Evaluation occurs on Chlorine (-Cl) spreadsheet page										
Dissolved oxygen	Yes	Evaluation occurs on Dissolved Oxygen (DO) spreadsheet page										
Oil and Grease	Yes	Compare to Effluent limits in permits or Federal Effluent Limit Guidelines										
Phosphorus, Elemental	Yes	*	*	*	--	--	*	--	--	na	na	--
Total dissolved solids	No	Compare to Effluent limits in permits or Federal Effluent Limit Guidelines										
Table 2: Effluent Parameters for Selected POTWs												
Hardness (Total as CaCO3)	Must be collected for metals criteria calculation. Submit data to the fields at the top of the spreadsheet											
Table 2: Metals (total recoverable), cyanide and totoal phenols												
ARSENIC III (State Only)	Yes	59	2.23	0.28	2.45	No	*	--	--	360.0	190.0	--
Cadmium	Yes	59	0.23	0.52	0.25	No	*	--	--	1.2	0.5	--
Chromium III + (State Only)	Yes	59	4.90	0.54	5.39	No	*	--	--	724.2	79.1	--
Chromium VI (State Only)	Yes	59	4.90	0.54	5.39	No	*	--	--	16.0	11.0	--
Copper	Yes	59	37.30	0.30	41.03	Yes	1.00	5.55	3.86	6.5	4.3	NO
Iron, dissolved (State Only)	No	*	*	0.60	--	--	*	--	--	na	####	--
Lead	Yes	59	1.06	0.27	1.17	Yes	0.52	0.59	0.57	21.0	0.7	NO
Mercury	Yes	38	0.03	0.45	0.04	Yes	0.00	0.00	0.00	2.4	0.0	NO
Nickel	Yes	59	15.00	0.68	16.50	No	*	--	--	574.7	58.4	--
Selenium	Yes	59	4.53	0.47	4.98	No	*	--	--	260.0	35.0	--
Silver	Yes	59	0.46	0.47	0.50	Yes	0.03	0.08	0.06	0.6	0.1	NO
Zinc	Yes	59	144.00	0.41	158.40	Yes	5.00	22.43	15.96	47.4	39.2	NO
Cyanide (Free)	Yes	59	22.20	0.89	26.64	Yes	1.50	4.36	3.30	22.0	5.2	NO
Table 2: Volatile organic compounds - No Aquatic Toxicity Criteria												
Table 2: Acid-extractable compounds												
pentachbrophenol	Yes	12	0.00	0.60	0.00	No	*	--	--	20.0	13.0	--
Table 2: Base-neutral compounds - No Aquatic Toxicity Criteria												
Table 3: Organochlorine Pesticides												
Aldrin	Yes	12	0.00	0.60	0.00	No	*	--	--	3.0	na	--
gamma-BHC (Lindane)	Yes	12	0.00	0.60	0.00	No	*	--	--	1.0	0.1	--
Chlordane	Yes	12	0.00	0.60	0.00	No	*	--	--	2.4	0.0	--
Chlorpyrifos (state only)	Yes	12	0.00	0.60	0.00	No	*	--	--	0.1	0.0	--
Demeton (State Only)	Yes	12	0.00	0.60	0.00	No	*	--	--	na	0.1	--
4,4'-DDT	Yes	12	0.00	0.60	0.00	No	*	--	--	1.1	0.0	--
Dieldrin	Yes	12	0.00	0.60	0.00	No	*	--	--	0.2	0.0	--
Endosulfan alpha	Yes	12	0.00	0.60	0.00	No	*	--	--	0.2	0.1	--
Endosulfan beta	Yes	12	0.00	0.60	0.00	No	*	--	--	0.2	0.1	--

Appendix B3: Reasonable Potential Analysis for Human Health Criteria

RPA Run Information	
Facility Name:	Medford RWRF
DEQ File Number:	55125
Permit Writer Name:	Jon Gaslk
Outfall Number:	1
Date of RPA Run:	enter date here
RPA Run Notes:	

Please complete the following General Facility Information		
1. Do I have dilution value from a mixing zone study? (Y/N)		Y
2. Is the receiving waterbody fresh water? (Y/N)		Y
3. If answered "N" to *Question 1*, then fill in the following table		
Eff. Flow Rate	MGD	*
Stream Flow: Harmonic Mean	CFS	*
Stream FLow: 30Q5	CFS	*
% dilution at MZ	%	*
Calculated dilution values		
Dilution @ Harmonic Mean Flow		na
Dilution @ 30Q5		na

4. If answered "Y" to *Question 1*, then fill in dilution values from mixing zone study	
Dilution @ RMZ under harmonic mean flow	29.1
Dilution @ RMZ under 30Q5 flow	16.1

5. Please enter statistical *Confidence* and *Probability* values (note: defaults already entered)		
Confidence Level	%	95%
Probability Basis	%	95%

Determine Monitoring Reqs.			Identify Pollutants of Concern					In-stream Conc.		Determine Reasonable Potential			
PARAMETER	Carcinogen Status	Evaluation required?	# of Samples	Effluent Conc.	Coefficent of Variance	Estimated Max Eff. Conc.	Exceed WQ at end of ppe?	Ambient Conc.	Max Total Conc. at RMZ	WQ Criteria Water + Fish	WQ Criteria Fish	Is there Reasonable Potential to Exceed? (Y/N) Water + Fish	Is there Reasonable Potential to Exceed? (Y/N) Fish
Pollutant Type	(Y/N)	(Y/N)		µg/l		µg/l	(Y/N)	µg/l	µg/l	µg/l	µg/l	Water + Fish	Fish
Table 1: Effluent Parameters for all POTWs w/a Flow > 0.1 MGD													
Nitrates-Nitrite	N	Yes	12	10.50	0.60	17.06	No	*	--	10000	na	--	--
Table 2: Effluent Parameters for Selected POTWs													
Hardness (Total as CaCO3)	Must be collect for metals criteria calculation. Submit data to the fields at the top of the spreadsheet												
Table 2: Metals (total recoverable), cyanide and totoal phenols													
Antimony	N	Yes	3	0.46	0.60	1.39	No	*	--	146	45000	--	--
Arsenic (Total)	Y	Yes	67	1.24	0.32	1.22	Yes	0.59	0.6134	0.0022	0.0175	YES	YES
Copper	N	Yes	67	37.30	0.29	36.63	No	*	--	1300	na	--	--
Iron: dissolved (State Only)	N	No	*	*	*	--	--	*	--	300	na	--	--
Nickel	N	Yes	67	15.00	0.69	14.41	Yes	0.10	0.9889	13.4	100	NO	NO
Selenium	N	Yes	67	4.53	0.46	4.40	No	*	--	10	na	--	--
Thallium	N	Yes	4	0.07	0.60	0.17	No	*	--	13	48	--	--
Cyanide (Free)	N	Yes	67	22.20	1.05	21.01	No	*	--	200	na	--	--
Table 2: Volatile organic compounds													
acrolein	N	Yes	12	0.00	0.60	0.00	No	*	--	320	780	--	--
acrylonitrile	Y	Yes	12	0.00	0.60	0.00	No	*	--	0.058	0.65	--	--
benzene	Y	Yes	12	0.00	0.60	0.00	No	*	--	0.66	40	--	--
carbon tetrachloride	Y	Yes	12	0.00	0.60	0.00	No	*	--	0.4	6.94	--	--
chlorobenzene	N	Yes	12	0.00	0.60	0.00	No	*	--	488	na	--	--
chloroform	Y	Yes	12	0.41	0.60	0.67	Yes	0.10	0.1195	0.19	15.7	NO	NO
1,2-dichloroethane	Y	Yes	12	0.00	0.60	0.00	No	*	--	0.94	243	--	--
1,1-dichloroethylene	Y	Yes	12	0.00	0.60	0.00	No	*	--	0.033	1.85	--	--
ethylbenzene	N	Yes	12	0.00	0.60	0.00	No	*	--	1400	3280	--	--
halomethanes (State Only)	Y	Yes	12	0.00	0.60	0.00	No	*	--	0.19	15.7	--	--
Polynuclear Aromatic Hydrocarbons (State Only)	Y	Yes	12	0.00	0.60	0.00	No	*	--	0.0028	0.031	--	--
1,1,2,2-tetrachloroethane	Y	Yes	12	0.00	0.60	0.00	No	*	--	0.17	10.7	--	--
tetrachloroethylene	Y	Yes	12	0.00	0.60	0.00	No	*	--	0.8	8.85	--	--
toluene	N	Yes	12	0.10	0.60	0.16	No	*	--	14300	424000	--	--
1,1,2-trichloroethane	Y	Yes	12	0.00	0.60	0.00	No	*	--	0.6	41.8	--	--
trichloroethylene	Y	Yes	12	0.00	0.60	0.00	No	*	--	2.7	80.7	--	--
vinyl chloride	Y	Yes	12	0.00	0.60	0.00	No	*	--	2	525	--	--
Table 2: Acid extractable compounds													
2,4-dichlorophenol	N	Yes	12	0.00	0.60	0.00	No	*	--	3090	na	--	--
2,4-dinitro-o-cresol	N	Yes	12	0.00	0.60	0.00	No	*	--	13.4	765	--	--
pentachlorophenol	N	Yes	12	0.00	0.60	0.00	No	*	--	1010	na	--	--
phenol	N	Yes	12	0.00	0.60	0.00	No	*	--	3500	na	--	--

Appendix B4: Reasonable Potential Analysis for pH

Calculation of pH of a mixture of two flows.
Based on the procedure in EPA's DESCON program (EPA, 1988. Technical Guidance on Supplementary Stream Design Conditions for Steady State Modeling. USEPA Office of Water, Washington D.C.)

	RPA for pH	
INPUT	Lower pH Criteria	Upper pH Criteria
1. DILUTION FACTOR AT MZ BOUNDARY - (Qe+Qr)/Qe	14	14
2. UPSTREAM/BACKGROUND CHARACTERISTICS		
Temperature (deg C):	16.4	16.4
pH:	7.3	8.1
Alkalinity (mg CaCO3/L):	30.1	30.1
3. EFFLUENT CHARACTERISTICS		
Temperature (deg C):	23.4	23.4
pH:	6.5	8.3
Alkalinity (mg CaCO3/L):	107.0	107.0
4. APPLICABLE PH CRITERIA	6.5	8.5
OUTPUT		
1. IONIZATION CONSTANTS		
Upstream/Background pKa:	6.41	6.41
Effluent pKa:	6.36	6.36
2. IONIZATION FRACTIONS		
Upstream/Background Ionization Fraction:	0.89	0.98
Effluent Ionization Fraction:	0.58	0.99
3. TOTAL INORGANIC CARBON		
Upstream/Background Total Inorganic Carbon (mg CaCO3/L)	33.97	30.71
Effluent Total Inorganic Carbon (mg CaCO3/L):	184.44	108.23
4. CONDITIONS AT MIXING ZONE BOUNDARY		
Temperature (deg C):	16.90	16.90
Alkalinity (mg CaCO3/L):	35.59	35.59
Total Inorganic Carbon (mg CaCO3/L):	44.71	36.25
pKa:	6.40	6.40
pH at Mixing Zone Boundary:	**7.0**	**8.1**
Is there Reasonable Potential?	**No**	**No**

Appendix C1: Cold Water Protection

Stream Meets Water Quality Criterion (OAR 340-041-0028(11)(b))

Analysis at 100% Stream Flow

Section 5.5 of the Temperature IMD

Critical Period --> November - December

Facility Name: Medford RWRF **Date:** 4/13/2011

Enter data into white cells below:

7Q10 =	906	cfs
Ambient Temperature	7.1	°C
Effluent Flow =	31	mgd
Effluent Temperature	17.25	°C
Allowable Increase =	1	°C

100% dilution = 20 dilution = (Qe+Qr)/Qe

ΔT at 100% Stream Flow = 0.51 °C No Reasonable Potential

Thermal Load Limit = N/A Million Kcals

Equation used to calculate ΔT at edge of MZ

$$\Delta T_{mz} = \frac{T_e + (S-1)T_a}{S} - T_a$$

Equation used to calculate thermal load limit

$$TLL = 3.7854 Q_e S \Delta T_{all} C_p \rho$$

Where:

Qe = Effluent Flow in mgd
S = Dilution
ΔT_{all} = Allowable temperature increase at edge of MZ (°C)
Cp = Specific Heat of Water (1 cal/g °C)
ρ = Density of Water (1 g/cm^3)
3785.41 = Flow conversion from mgd to m^3/day

Appendix C2: Thermal Plume Migration Blockage RPA

Thermal Plume Limitations within the Mixing Zone Rule (OAR 340-041-0053)

Thermal Shock - 25 deg C at 5% of the stream cross section
Migration Blockage - 21 deg C at 25% of the stream cross section
Section 5.6 of Temperature IMD

Facility Name: Medford RWRF **Date:** 8/31/2011

Enter data into white cells below:

7Q10 =	870	cfs	
Ambient Temperature or Criterion	16.4	°C	
Effluent Flow =	20	mgd	
Max Effluent Temperature =	24.9	°C	
7 day Max Effluent Temperature =	24.8	°C	
5% of 7Q10 =	43.5	cfs	
5% dilution =	2		
25% of 7Q10 =	217.5	cfs	
25% dilution =	8	dilution = (Qe+Qr)/Qe	
Temperature at 5% cross section =	**19.93**	**°C**	**No Reasonable Potential**
Temperature at 25% cross section =	**17.45**	**°C**	**No Reasonable Potential**
ΔT at 25% Stream Flow=	**1.05**	**°C**	

Equation used to calculate ΔT at edge of MZ

$$\Delta T_{mz} = \frac{T_e + (S-1)T_a}{S} - T_a$$

Equation used to calculate thermal load limit

$$TLL = 3.7854 Q_e S \Delta T_{all} C_p \rho$$

Where:

Qe = Effluent Flow in mgd
S = Dilution
ΔT_{all} = Allowable temperature increase at edge of MZ (°C)
Cp = Specific Heat of Water (1 cal/g °C)
ρ = Density of Water (1 g/cm^3)
3785.41 = Flow conversion from mgd to m^3/day

Appendix D: Compliance Schedule Review Sheet

Medford RWRF File # 55125

Compliance Schedules in NPDES Permits Thermal Credits Oregon Department of Environmental Quality
DEQ10-WQ-0040-IMD Last updated 06/21/10
Version 1.0 Page 10 of 18

Appendix A: Permit Writer's Checklist

Information establishing need for and terms of a Compliance Schedule

A permittee requesting a compliance schedule to meet new or more stringent permit limits must provide the following for the permit writer to use in determining whether a compliance schedule is appropriate and if so, what the length and terms should be.

☑ Results of studies, modeling, and/or pilot studies aimed at quantifying pollutant levels in the discharge and the sources of those pollutants in the waste stream. See Eval. Report

☐ Information showing that there is a need for substantial modifications to treatment facilities, operations or measures to meet the new permit limits. [For example, existing effluent data and/or analysis that shows compliance with new permit limits is not immediately possible upon the effective date of the permit; or documentation about what type of upgrades will be necessary and how long such upgrades are likely to take.] See Eval Report

☐ Detailed information and explanation about why the modifications cannot be made before the new permit limits take effect. [For example, an email or letter from the permittee explaining what steps will be necessary to obtaining financing, conduct assessment and planning, design facilities, procure a contractor, time for construction and start-up.] see 6/20/11 Submittal

☐ Proposed critical path schedule, detailing the steps needed to modify or install treatment facilities, operations or other measures (e.g., pretreatment measures) for coming into compliance with the new permit limits. The steps in the schedule may include but are not limited to:

a) Completion of design as well as any necessary environmental studies and reviews.
b) Time reasonably necessary to obtain required financing.
c) Purchase of property needed for construction.
d) Obtaining any permits necessary to undertake construction such as building permits or construction stormwater permits.
e) Construction of any necessary facilities.
f) Purchase and installation of any necessary equipment.
g) Testing or troubleshooting new facilities or equipment to confirm satisfactory performance.

A schedule for implementing a new or significantly expanded program may include but is not limited to:

a) Program design. Done
b) Development of necessary ordinances.
c) Hiring of staff.
d) Public outreach.
e) Program evaluation and modification.

- ☑ If the compliance schedule is expected to extend beyond one year, information to establish interim requirements. [For example, sequence of actions or operations leading to compliance with the WQBEL proposed by the permittee and associated dates for their achievement. This information will be used to determine the milestones in the compliance schedule, as discussed in Part 4.2 of this IMD.]

- ☑ Documentation of source control efforts currently underway or completed, including implementation status and compliance status with any pollution prevention programs or industrial pretreatment programs that have been established.

- ☑ A proposed critical path schedule for additional source control measures or waste treatment.

- ☑ The highest discharge quality (e.g. concentrations, mass loadings, etc.) that is technically and economically achievable on a consistent basis until final WQBEL compliance is attained.

- ☑ A demonstration that the proposed schedule of compliance is as short as technically possible. Section 3.2 contains information relevant to determining timeframes.

- ☑ Additional information and analyses, to be determined by the permit writer on a case-by-case basis.

Appendix E: Antidegradation Review Sheet

1. What is the name of Surface Water that receives the discharge? Rogue River
   Briefly describe the proposed activity: Domestic Wastewater Treatment Plant
   Is this review for a renewal OR new (circle one) permit application?
   Go to Step 2.

2. Is this surface water an **Outstanding Resource Water** or **upstream** from an **Outstanding Resource Water**?
   Yes. Go to Step 5.
   (No.) Go to Step 3.

3. Is this surface water a **High Quality Water**?
   Yes. Go to Step 8.
   (No.) Go to Step 4.

4. Is this surface water a **Water Quality Limited Water**?
   Yes. Go to Step 14.
   (No.) Go to Step 2. Note: The surface water must fall into one of three (3) categories: Outstanding Resource Water (Step 2), High Quality Water (Step 3), or Water Quality Limited Water (Step 4).

14. Will the proposed activity result in a Lowering of Water Quality in the **Water Quality Limited Water**? [see OAR 340-041-0004(3)-(5) for a description in rule of discharges that do not result in lowering of water quality or do not constitute a new and/or increased discharge or are otherwise exempt from antidegradation review; otherwise see "Is an Activity Likely to Lower Water Quality?" in *Antidegradation Policy Implementation Internal Management Directive for NPDES Permits and Section 401 Water Quality Certifications*.]
   Yes. Go to Step 15.
   (No.) Proceed with Permit Application. Applicant should provide basis for conclusion. Go to Step 21.

21. On the basis of the Antidegradation Review, the following is recommended:
   _X_ Proceed with Application to Interagency Coordination and Public Comment Phase.
   ____ Deny Application; return to applicant and provide public notice.

Action Approved
Section: Western Region – WQ Permitting
Review Prepared By: Jon Gasik, MS, PE
Phone: 541-776-6242
Date Prepared: June 17, 2011

Appendix F: Operator Certification Review Sheet

Wastewater System Classification Worksheet for Operator Certification OAR 340-049-0020

WW System Common Name: Medford RWRF

Facility ID: 55125 **Location:** 1100 Kirtland Road, Central Point, OR

Total Points (from page 3): 94 **WWT Class (check):** ☐ I ☐ II ☐ III ☒ IV

Design Population[1]: 286,000 **WWC Class (check):** ☐ I ☐ II ☐ III ☒ IV

Design ADWF load (influent MGD) 20 **Design BOD load (influent lbs./day)** 41,000

Classified by: Jon Gasik, MS, PE **Date:** June 17, 2011

Date this classification filed with the Operator Certification Office: June 17, 2011

System start-up date for this classification (new, upgrade or expansion): NA

Is this a change from a prior classification? (check): ☐ Yes ☒ No

STEP 1 - Criteria for Classifying Wastewater Treatment Systems (OAR 340-049-0025)

(1) **Design Population or Population Equivalent Points** (10 Points Maximum)

☐ Less than 750	0.5 points
☐ 751 to 2000	1 point
☐ 2001 to 5000	1.5 points
☐ 5001 to 10,000	2 points
☒ Greater than 10,000	3 points+1 pt. for ea. add. 10k
Part 1 Subtotal	10 points

(2) **Average Dry Weather Flow (Design Capacity) Points** (10 points Maximum)

☐ Less than 0.075 MGD	0.5 point
☐ Greater than 0.075 to 0.1 MGD	1 point
☐ Greater than 0.1 to 0.5 MGD	1.5 points
☐ Greater than 0.5 to 1.0 MGD	2 points
☒ Greater than 1.0 MGD	3 points+1 pt. for ea. add. MGD
Part 2 Subtotal	10 points

(3) **Unit Process Points** (Check all that apply)

Preliminary Treatment and Plant Hydraulics: See also STEP 2

☐ Comminution (cutter, shredder, grinder, barminutor, etc.)	1 point
☒ Grit Removal, gravity	1 point
☒ Grit Removal, mechanical	2 points
☒ Screen(s), in-situ or mechanical (coarse solids only)	1 point
☐ Pump/Lift Station(s) (pumping of main flow)	2 points
☐ Flow Equalization (any type)	1 point
Subtotal	4 points

Primary Treatment: _____

☐ Community Septic Tank(s) (STEP, STEG, etc)	2 points
☒ Clarifier(s)	5 points
☐ Flotation Clarifier(s)	7 points
☐ Chemical Addition System	2 points
☐ Imhoff Tanks, (large septic tank or similar sedimentation & digestion)	3 points
Subtotal	5 points
Page 1 Subtotal	29 points

[1] See "Population" definition. Use the design average daily equivalent load per person for influent flow or influent BOD5, whichever is greater. This value is used to determine the Collection System Classification.

Wastewater System Classification Worksheet

Unit Process Points – Continued (Check all that apply) Medford RWRF

Secondary, Advanced, and Tertiary Treatment **See also STEP 2:**

☐ Low Rate Trickling Filter(s) (no recirculation)	7 points
☐ High Rate Trickling Filter(s) (recirculation)	10 points
☐ Trickling Filter - Solids Contact System	12 points
☒ Activated Sludge (includes SBR & basic MBR process)	15 points
☐ Pure Oxygen Activated Sludge	20 points
☐ Activated Bio Filter Tower less than 0.1 MGD	6 points
☒ Activated Bio Filter Tower greater than 0.1 MGD	12 points
☐ Rotating Biological Contactors 1 to 4 shafts	7 points
☐ Rotating Biological Contactors, 5 or more shafts	12 points
☐ Stabilization Lagoons, 1 to 3 cells without aeration	5 points
☐ Stabilization Lagoons, 1 or more cells with primary aeration	7 points
☐ Stabilization Lagoons, 2 or more cells with full aeration	9 points
☐ Recirculating Gravel Filter	7 points
☐ Chemical Precipitation Unit(s)	3 points
☐ Gravity Filtration Unit(s)	2 points
☐ Pressure Filtration Unit(s)	4 points
☐ Nitrogen Removal, Biological (BNR) or Chemical/Biological System	4 points
☐ Nitrogen Removal, Designed Extended Aeration Only (Nitrification)	2 points
☐ Phosphorus Removal Unit(s)	4 points
☐ Effluent Microscreen(s)	2 points
☐ Chemical Flocculation Unit(s)	3 points
☐ Chemical Addition System @ 2 points (describe): _____	27 points
Subtotal	_____ points

Solids Handling (Excludes long-term storage in lagoons above) **See also STEP 2:**

☐ Anaerobic Primary Sludge Digester(s) w/o Mixing and Heating	5 points
☐ Anaerobic Primary Sludge Digester(s) with Mixing and Heating	7 points
☒ Anaerobic Primary and Secondary Sludge Digesters	10 points
☐ Sludge Digester Gas reuse	3 points
☐ Aerobic Sludge Digester(s)	8 points
☒ Sludge Storage Lagoon(s) (List Basin(s) or Tank(s) under STEP 2)	2 points
☐ Sludge Lagoon(s) with aeration	3 points
☐ Sludge Drying Bed(s)	1 point
☐ Sludge Air or Gravity Thickening	3 points
☐ Sludge Composting, In Vessel	12 points
☐ Sludge Belt(s) or Vacuum Press/Dewatering	5 points
☐ Sludge Centrifuge(s)	5 points
☐ Sludge Incineration	12 points
☐ Sludge Chemical Addition Unit(s) (alum, polymer, alkaline stab. etc.)	2 points
☒ Non-Beneficial Sludge Disposal (landfill or burial)	1 point
☐ Beneficial Sludge Utilization (see also STEP 2)	3 points
Subtotal	13 points

Disinfection:

☒ Liquid Chlorine Disinfection	2 points
☐ Gas Chlorine Disinfection	5 points
☒ Dechlorination System	4 points
☐ Other disinfection systems including ultraviolet and ozonation	5 points
Subtotal	6 points
Page 2 Subtotal	46 points

Wastewater System Classification Worksheet

(4) **Effluent Permit Requirement Points** (Check as applicable) **See also STEP 2**:

☐ Minimum of secondary effluent limitations for BOD and/or TSS	2 points
☐ Minimum of 20 mg/L BOD and/or Total Suspended Solids	3 points
☒ Minimum of 10 mg/L BOD and/or Total Suspended Solids	4 points
☐ Minimum of 5 mg/L BOD and/or Total Suspended Solids	5 points
☐ Effluent limitations for effluent oxygen (For other limits see Step 2)	1 point
Part 4 Subtotal	4 points

(5) **Variation in Raw Waste Points**. Points in this category will be awarded only when conditions are extreme to the extent that operation and handling procedure changes are needed to adequately treat waste due to variation of raw waste (strength or flow)

☐ Recurring deviations or excessive variations 100% to 200%	2 points
☐ Recurring deviations or excessive variations of more than 200%, or conveyance and treatment of industrial wastes by pretreatment program	4 points
☐ Septage or truck-hauled waste	2 points
Part 5 Subtotal	_____ points

(6) **Sampling and Laboratory Testing Points** (check as applicable)

☐ Sample for BOD, Total Suspended Solids performed by outside lab or	2 points
☒ BOD or Total Suspended Solids analysis performed at treatment plant	4 points
☐ Bacteriological analysis performed by outside lab or	1 point
☒ Bacteriological analysis performed at WWT plant lab	2 points
☐ Nutrient, Heavy Metals or Organics analysis performed by outside lab or	3 points (≤1/mo. 1 pt)
☒ Nutrient, Heavy Metals or Organics analysis performed at WWT plant	5 points
Part 6 Subtotal	11 points
Parts 4-6 Total	15 points*

OAR 340-049-0025 Accumulated Points, pg1 29, pg2 46 & pg3* 15 = 90 Go to Step 2▼

STEP 2 - Complexity Not Reflected Above (OAR 340-049 0020(4))

Note: This step may justify a higher classification. Points shown are given as guidance.

☐ Fine Screen Preliminary Treatment (includes washing & compaction)	2 points
☒ SCADA or similar instrumentation providing data w/ process op. (2-4 pts)	4 points
☐ Post aeration, includes mechanical and diffused aeration (not cascade)	1 point
☐ Class A recycled water (storage, distribution & monitoring)	6 points
☐ Class B, C, D and non-disinfected recycle (surface & subsurface)	3 points
☐ Sludge dewatering using bag or tube system	1 point
☐ Composting, ASP or windrow	6 points
☐ Land application of biosolids by system operator (add to BSU pts. Pg. 2)	5 points
☐ Odor or corrosion control (separate or combined)	2 points
☐ Chemical/Physical advanced waste treatment (10 -15 points)	_____ points
☐ Reverse Osmosis or Electro-dialysis	15 points
☐ Other Effluent Requirements @ 1 pt (describe): _____	_____ point(s)
☐ Other (describe): _____	_____ point(s)
OAR 340-049-0020(4) points	4 points

Accumulated Point Total - Steps 1 and 2 (enter here and on page 1) **94 points**

A COPY OF THIS COMPLETED WORKSHEET TO BE FILED WITH THE OPERATOR CERTIFICATION PROGRAM OFFICE, WQ DIVISION, PRIOR TO SYSTEM START-UP

Proposal
Medford Regional Water Reclamation Facility
Thermal Credit Trading Program

As part of the Rogue Basin Total Maximum Daily Load (TMDL), the Oregon Department of Environmental Quality (DEQ) is implementing temperature limits on permitted dischargers. To meet these new thermal limits at the Medford Regional Water Reclamation Facility, the City of Medford is proposing to use streamside re-vegetation projects that will reduce stream warming caused by radiant heating

This document provides an explanation of the plan to offset thermal impacts and includes the solar load reduction calculation methodology, site selection and location criteria, landowner recruitment and contracting requirements, and standards for site assessment, site planning, implementation, maintenance and monitoring, remediation measures to address underperforming sites, and third party verification and registration procedures.

Temperature TMDL / Trading Requirements

The TMDL set by DEQ for Temperature in the Rogue Basin includes an allocation for the Medford RWRF of 0.1772 °C. That is, discharge from the treatment plant cannot raise the river temperature more than 0.1772 °C. For practical use in determining trading requirements, this allocation is converted to a measurement of heat utilizing average plant flow and the 7Q10 river flow (the seven-day average low flow with a ten year return frequency). Heat is measured with the unit of millions of kilo-calories per day (kCal/day).

The Medford Regional Water Reclamation Facility (RWRF) has a permitted design capacity of 20 million gallons per day. Because the thermal load that is discharged is based on the plant flow, the thermal discharge will continue to increase as growth causes flows to increase. This will increase the amount of trading that needs to be achieved to comply with the TMDL.

Based on existing conditions, the estimated projected maximum heat discharged to the river can exceed the waste load allocation by 267 million kilocalories when river flows are at or below 7Q10 conditions. As the region grows, the plant flow will increase and the amount that the excess temperature load exceeds the allocation will increase. By the year 2030, mitigation of approximately 400 million kilocalories is anticipated. Based on this projection, Table 1 shows the goals for mitigation expressed in miles of river restoration as well as estimated kilocalories of credits. The miles of restoration are an estimate and will change based on the shade potential that is available from the selected projects.

Table 1. Restoration Goals for the Temperature Offsets		
Year	No. of Miles Restored	Cumulative Kilo-Calories Offset, millions
2012	1.00	10,500,000
2013	3.00	42,100,000
2014	3.00	73,700,000
2015	3.00	105,300,000
2016	3.00	136,900,000
2017	3.00	168,500,000
2018	3.00	200,100,000
2019	3.00	231,700,000
2020	3.00	263,300,000
2021	3.00	294,900,000
2022	1.40	309,700,000
2023	1.40	324,500,000
2024	1.19	337,000,000
2025	1.00	347,500,000
2026	1.00	358,000,000
2027	1.00	368,500,000
2028	1.00	379,000,000
2029	1.00	389,500,000
2030	1.00	400,000,000

Implementation

Implementation of the TMDL will be addressed as part of the revised NPDES permit and compliance schedule. The RWRF could exceed the TMDL at any time that the Rogue River flows approach draught conditions. Consequently, interim limits will be needed as well as a compliance schedule to establish a time frame for meeting the TMDL.

Project Management / Potential Trading Partners

The City of Medford issued a Request for Proposals (RFP) to select a trading partner that will be responsible to organize and manage all restoration and trading activities and the City is currently negotiating an agreement with The Freshwater Trust for these services. The partner organization will oversee the trading program including preliminary modeling and site selection through monitoring and maintenance, third party verification and registration procedures. Medford plans to enter into an agreement with The Freshwater Trust (TFT) whereby TFT will develop, finance, certify, register and maintain the restoration projects and the City will purchase the credits for the completed project.

The basis for selecting TFT was the experience and capacity of TFT to develop credits that are registered and to maintain the restored sites. The City will work with DEQ to be consistent with the DEQ internal management directive *"Water Quality Trading in NPDES Permits, Internal Management Directive"* dated December 2009

Geographic Boundary

Projects under this permit will be completed on sites in the approved offset area: the Rogue River watershed upstream of the point of maximum impact at river mile 62 including the Bear Creek watershed. See Appendix A for a map that shows the area for potential solar load reduction.

Site Selection and Assessment

Recruitment and Site Selection

Sites will be selected that meet geographic criteria, thermal reduction potential, and pertinent biological priorities (i.e. all projects will be completed in salmon bearing streams subject to the same cold water quality criteria of the facility). Sites with the highest potential for generating credits will be preferred.

Timeline: Recruitment activities will begin upon signed contract between TFT and the City of Medford and continue until obligations are met.

Site-specific Solar Load Reduction Calculation

Potential project sites will be evaluated using the Shade-a-lator model 6.2 (DEQ 2009a) for Bear Creek and Version 8 for the Rogue River. The model will be used to calculate baseline solar radiation flux and associated effective shade based on the geographic and vegetative characteristics of the stream channel. The model will also be used to calculate the post-restoration heat load, which is the basis for establishing kcal reduction values.

While excess thermal load can be encountered in September through the end of October, the largest excess has historically occurred on October 16 and will continue to be on that date. Wastewater temperatures drop during October so the most critical conditions occur on the first day of the compliance period when river flows and the applicable temperature criterion are at their lowest level. Solar radiation conditions for October 16 will be used to compute the temperature credits.

A trading ratio of 2:1 will be employed unless otherwise approved by DEQ.

Timeline: Ongoing, concurrent with recruitment activities.

Re-vegetation Project Standards

Each project site is unique, but planning, implementation, maintenance and monitoring specifications will be governed by the Re-vegetation Standards (described below). These standards are required to ensure consistent project quality and performance over time.

Site Assessment & Baseline Monitoring

Field visits are required for eligible sites in order to develop a baseline credit estimate and develop a restoration plan appropriate for the current site conditions. Site assessment and baseline reports will include:

- **Map of restoration site:** A map in a standardized format that includes documentation of invasive plant coverage, evidence of flooding regime, and site conditions relevant to plant selection.
- **Current site conditions assessment:** A standardized database must be used to record, in detail, current site conditions and any relevant baseline condition observations that may influence performance of the site (i.e. adjacent property use, evidence ungulate browsing or livestock damage, etc.).
- **Photo-point establishment and baseline photos:** Photo-point monitoring locations will be established to document baseline conditions. These same photo points will be used annually to track site conditions and monitor changes in vegetation and structure. A minimum of one point will be selected to accurately showcase the features of the site. A minimum of four, high quality, digital photos (one from each cardinal direction from the established photo-point) must be taken that clearly and visibly depicts vegetation cover and structure in order to document a 360 degree view of the site. The pictures, as well as their corresponding longitude and latitude, must be stored in an accessible electronic database that will be updated annually to record and register site conditions and ongoing performance.

Timeline: Site assessments and monitoring will continue for the contracted life of the project.

Re-vegetation Project Design

Project designs must be customized for each site using the following standard components:

- **Planting area:** Plantings will be focused on land outside of active channel and above bankfull height, unless site conditions and ecological need demands otherwise (e.g. willow plantings to stabilize banks or reduce width to depth ratios, or plantings on point bars, islands, etc.).
- **Stem density:** Tree stem density and shrub stem density (stems per acre) targets will be established with using a reference site for a specific habitat type. The average density may vary depending on site-specific issues or reference site conditions. Sites will be designed to meet the stem density and structural characteristics of reference sites in the watershed (sites chosen to represent the least human impaired areas). Reference sites will be identified within the project's 5th field Hydrologic Unit Code (HUC). A target density of 1,600 stems per acre at project year 5 is the current standard.

- **Plant composition:** Species diversity targets will help to ensure a project's sustainability over the long term. A mix of Oregon native trees and shrubs will be selected that replicate the natural variability of reference sites in the watershed (sites chosen to represent the least human impaired areas. Reference sites will be identified within the project's 5th field Hydrologic Unit Code (HUC). Planting areas may be divided into hydrologic zones based on elevation; species composition will be determined accordingly. No more than 20% non-native woody vegetation cover will be allowed.
  - — Current standard: At least five woody species, no single species representing more than 50% of the woody plants, trees should account for at least 20% of the total stems per acre target, and shrubs should account for at least 20% of the total stems per acres target.
- **Plant procurement:** Proper plant materials are necessary to ensure plantings will survive under local conditions over the long term. The following guidelines will be followed when selecting plant materials:
  - — Transplanted material must come from outside the bankfull width.
  - — Indigenous-derived plant material will be utilized, unless unavailable or otherwise impossible.
  - — One to two-year old bare root seedlings will be utilized wherever possible.
- **Buffer width:** Projects intended for temperature reductions will be designed with an average buffer width of 60 feet, measured from the edge of the stream bank. Actual buffer widths may vary depending on site characteristics.

Timeline: Project designs will be created as project sites are selected.

Site Preparation

Timing of site preparation is vital to the success of a riparian re-vegetation project. Many riparian areas have been degraded by past land use or infestation by invasive species, such as Himalayan blackberry. Site preparation will include steps to address continued degradation and the removal of existing non-native woody vegetation and preparation of the soil surface.

Invasive plant removal: Invasive plants are defined as those plants included on the Oregon State Noxious Weed list[1] compiled by the Oregon Department of Agriculture. Invasive plant infestations will be treated using manual and mechanical methods and chemical herbicides appropriate for riparian work. Treatments may involve a combination of methods.

Manual and mechanical methods include: hand pulling, seed clipping, stabbing, girdling, cutting, solarization[2], scarification[3], chopping, and mowing. Equipment may include hand-held tools, power tools, and heavy equipment including tractors and bulldozers.

[1] http://www.oregon.gov/ODA/PLANT/WEEDS/statelist2.shtml

[2] Solarization is the technique of covering the ground surface with plastic sheeting to increase solar radiation and raise ground temperatures to kill plants, seeds, and other undesirable organisms (Tu et al. 2001). Opaque plastic can be used to block sunlight and kill existing plants.
(Katan et al. 1987 in Tu et al. 2001).

Herbicide treatments include the following: stem injection, cut-stump, wicking and wiping, spot application, and hack and squirt. Broadcast aerial spraying will not be permitted. Herbicides are limited to chlorsulfuron, clopyralid, aquatic labeled glyphosate, imazapyr (aquatic and non-aquatic labeled), metsulfuron methyl, and sethoxydim, sulfometuron methyl. Only surfactants or adjuvants that do not contain any ingredient on EPA's List 1 or 2[4] may be used. No herbicide will be applied if precipitation is forecasted within 24 hours. All herbicide treatments will comply with label instructions. A certified/licensed herbicide applicator will oversee all herbicide application projects.

Soil improvement: On compacted, agricultural soil, improving soil structure will improve plant survivorship. Loosening the upper portion of the soil profile effectively reduces compaction, increases water infiltration, aerates the soil, and makes planting in the soil easier. It will also be important for the disruption of invasive weed root systems that would inhibit new plant growth and foster rapid regeneration of the non-native vegetation if left intact.

Site soil will be prepared by auguring each planting site to a depth of 12 inches or, for larger sites, soil can be disked. Soil disking should not occur within 10 feet of the top of the stream bank to reduce the risk of bank failure or erosion. It should also not occur within 10 feet of existing native trees to reduce the risk of root damage. If the soil is disked, an erosion control seed mix will be sprayed to reduce soil erosion and invasive plant growth.

Disked or sprayed areas will be seeded with a native erosion control seed mix containing native grasses that establish quickly and aid in controlling erosion with little competing nutrient uptake. The mixture should be applied at 30lbs of pure live seed (PLS) per acre.

Timeline: May occur annually - April through September

Plant Installation

Riparian plant installation will occur in the late winter or early spring after the threat of winter flood events has passed. In cases where it is advantageous, potted material may be planted in the late fall months. A restoration professional will obtain the appropriate number of bare-root trees and shrubs. Care will be taken to ensure plant material is free of weeds and compatible with the project site (e.g., plant material from outside the site is sown from indigenous seed which will survive well at the site's elevation and climate). Cuttings from native *Salix*, *Cornus*, *Spiraea* and *Lonicera* shrubs may be used to supplement bare root plantings, especially on steep streambanks and in the active channel. Transplanted material must come from outside the bankfull width, typically in abandoned floodplains, and where such native plant material is often abundant.

A restoration professional will be onsite to lay plants out in their proper hydrologic zone and at the spacing dictated by the planting plan. Techniques such as tree protection tubes, or similar practices or technology will be used to minimize plant losses due to herbivory or damage from routine maintenance tasks (mowing/weed-whacking).

[3] Scarification is the cutting of the top layer of soil.

[4] EPA listing indicates a chemical is of toxicological concern or is potentially toxic with a high priority for testing. See EPA's website for more information: http://www.epa.gov/opprd001/inerts/fr52.htm

Timeline: Planting will occur in the winter and early spring months when bareroot nursery stock is available. In cases where it is advantageous, potted material may be planted in the late fall months

Monitoring

All planting sites will be monitored to confirm success of the planting project and guide remediation actions if needed. Success of the riparian establishment plan will result in the restoration of several riparian habitat functions; however, this plan will specifically measure success relative to vegetation growth, cover, and diversity. Third party verification will occur on the schedule outlined below.

Monitoring schedule: Monitoring will be more robust during the establishment period. It is expected re-vegetation projects will reach a free-to-grow state in five years. 'Free-to–grow' is defined as a project with healthy trees, taller than competing vegetation and well distributed across the area[5]. Monitoring will be conducted at least once a year for the first five years and in response to any events, such as floods or fires, that may cause damage at a project site. Monitoring reports will be developed as follows:

Years 1-4 monitoring reports will include the following components:

- Updated map of restoration site, clearly demarcating areas of plant mortality or damage and other issues, such as erosion, as well as areas where plants are thriving.
- Census of planted species, including survival and mortality. Transect surveys will be completed for large areas.
- A summary of needed corrective measures or future maintenance needs and a schedule of when those actions will take place.
- Photo-point monitoring

Year 5 monitoring report will include the above components. In addition, an assessment will be completed to determine that each site is meeting the following requirements:

- The site has reached a free-to-grow state.
- The site will have no more than 20 percent non-native woody vegetation cover (average) at project Year 5.
- The site will have no fewer than five woody species and no single species may represent more than 50 percent of the woody plants at project year five.
- Neither trees nor shrubs will represent less than 20 percent of the total stems per acre at project Year 5.

Years 10, 15, and 20, monitoring reports will include the following or when floods, fires or other acts of God may indicate the need for monitoring:

- Updated map
- Summary of site conditions

[5] Oregon State University. *The Care and Planting of Tree Seedlings on your Woodland.* 2006.

- Summary of maintenance needs, including a schedule of tasks to be completed.
- Photo-point monitoring

Remediation

If the site is not performing to standards at Year 5, action will be taken to correct any problems, including replanting the site, excluding circumstances in which the loss or damage is due to acts of God. Loss due to flood, fire, or other events beyond the reasonable control of the City will not be cause for automatic replacement or repair of the damaged portion of a site. Maintenance will be continued and restoration of the site function will be assessed.

Timeline: Monitoring will be completed each fall. Remediation activities will occur as necessary throughout the project period.

Maintenance

Maintenance will include invasive plant control and replacement of failed plantings when needed. Scheduled maintenance tasks will occur on the timeline outlined below. Additional maintenance may take place as prescribed by routine monitoring reports.

Year 1

- Newly installed plantings will be irrigated as needed, dependent on soil moisture conditions. Irrigation will be completed by a trained contractor either from an onsite spring, rain catchment system, or directly from the stream.

Years 1 – 5

- Invasive plant control: Invasive plants will be managed by mowing the project site as needed annually. On severely infested sites, additional herbicide treatment may be required according to standards in the invasive plant removal section above.
- In-fill planting: Plant mortality between 10-20% is common. The original planting plan will be used as a guide for in-fill planting to replace failed plants, as well as an assessment on the success/failure of the on-site plants.
- Any materials used to minimize maintenance or herbivore damage (i.e. tree tubes or similar technology) will be removed during the fourth year after plant installation, unless there is a demonstrated need for continued use.

Years 5 – 20

Maintenance will be reduced after sites have achieved free-to-grow conditions. However, if a site sustains damage, corrective actions, including in-fill planting to replace failed plants will be completed as needed.

Timeline: Invasive control will occur in summer; in-fill planting will occur in spring.

Landowner Agreements

Signed landowner agreements or easements are required for each credit producing site. The agreement or easement must include the exclusive right to use the riparian area covered under the agreement for silvicultural activities required to meet and maintain vegetation standards. The agreement or easement must include the right to access the project site for the purposes of project implementation, maintenance and monitoring. The agreement or easement must also bar any activities in the project area detrimental to the goals of the project. Where required, agreements or easements will be recorded with the county land office.

Third Party Credit Verification

Third party verification will be required by the City. An organization that provides accredited professionals will be sought to independently verify that project land rights are secured for the duration of the credit life, site implementation standards are met, and that credit calculations are correct. Specific activities will include:

On-site inspection immediately following implementation of each project. To validate that credits can be used for compliance, riparian shade projects will have an accredited verifier attest that each project meets minimum design standards, has documented secure land access rights, and that credit calculations are accurate and free from material misstatements. The accredited verifier will use rapid visual assessment methods which were developed by The Willamette Partnership in coordination with DEQ to verify that credit calculations are within a 15-percent margin of error. Initially, the City intends to use accredited professionals trained by The Willamette Partnership.

Annual review of monitoring reports. Accredited verifiers will verify annually that monitoring reports reflect fulfillment of obligations and standards are met for 4 years after initial site visit.

Five year cycle on-site inspection of project performance. Every 5 years, accredited third-party verifiers will conduct on-site inspections. Over an average 20 year credit cycle, each project will receive inspection and attestation from at least four accredited professionals, assuring quality and demonstrating independent professional consensus that projects meet compliance standards.

Projects tracked on an online database. Project information will be available to agencies through a transparent, web-accessible, and credible registration system. This system will enable DEQ to demonstrate that compliance standards are met and will also address EPA's water quality trading requirement of "timely public access to information on trades."

Ancillary Benefits of a Temperature Trading Program

In addition to effectively lowering temperatures in the Rogue River, adoption of a temperature trading program has many ancillary benefits for the public and the environment. Economic analysis conducted as part of Medford RWRF facility plan (*West Yost Associates, 2011*) has shown that the cost of a temperature trading program is significantly less than the available alternatives. Evaluated alternatives included effluent chillers and effluent storage. These alternatives are not only more costly, but also more energy intensive; particularly effluent

chillers. The adoption of a lower cost solution will produce lower costs to rate payers and thus presents a public benefit.

The alternative temperature management options also do not provide any ancillary environmental benefits. The streamside rehabilitation and planting efforts conducted as part of this trading plan will improve habitat for wildlife and reduce silting be decreasing bank erosion.

Financing

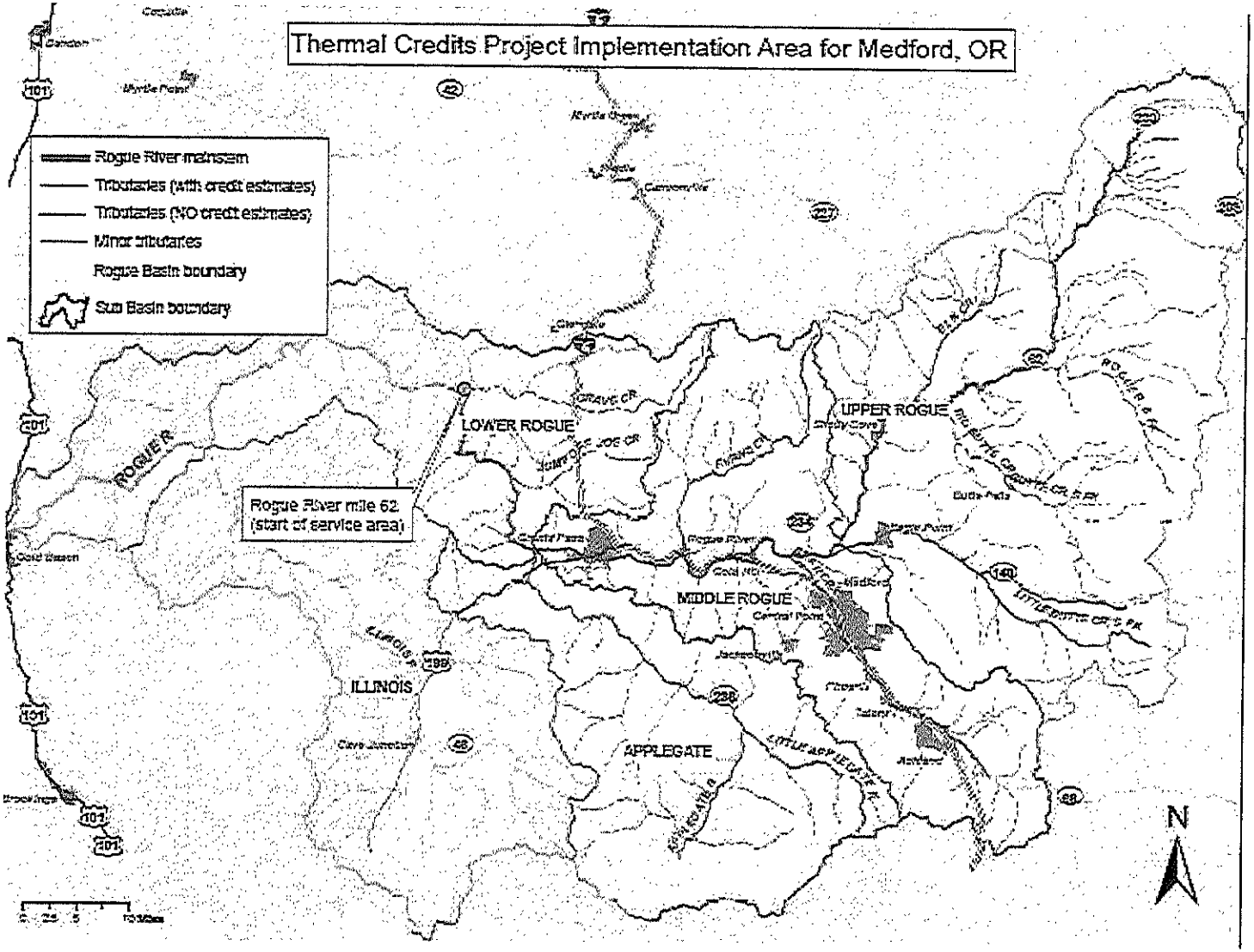
The City of Medford has financed capital improvements on a pay as you go basis using rates to fund capital projects. Rates are adjusted to meet both operation and maintenance costs of the RWRF as well as the projected capital costs. The draft Facilities Plan includes a capital improvement plan (CIP) for the next ten years including the annual expenditures for the temperature trading program as shown in Table 2.

Based on the proposed CIP, the City will meet with the Regional Rate Commission to rate requirement to support the CIP. Development of the financing plan will be completed concurrently with the development of the pilot project.

Table 2. Estimated Cost for Restoration

Year	No. of Miles Restored	Annual Capital Costs, $1,000	O&M Costs, $1,000	Total Cost, $,1000
2012	1.00	135,000	3,000	137,000
2013	3.00	407,000	23,000	429,000
2014	3.00	415,000	64,000	480,000
2015	3.00	423,000	101,000	524,000
2016	3.00	428,000	119,000	547,000
2017	3.00	432,000	155,000	587,000
2018	3.00	434,000	168,000	602,000
2019	3.00	435,000	181,000	616,000
2020	3.00	435,000	194,000	629,000
2021	3.00	436,000	197,000	633,000
2022	1.40	222,000	209,000	431,000
2023	1.40	218,000	194,000	412,000
2024	1.19	186,000	178,000	364,000
2025	1.00	159,000	167,000	326,000
2026	1.00	156,000	155,000	310,000
2027	1.00	154,000	160,000	315,000
2028	1.00	155,000	158,000	313,000
2029	1.00	155,000	156,000	311,000
2030	1.00	154,000	156,000	310,000

Appendix A. Area Eligible for Trading



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